DOCUMENT RESUME

ED 181 891	IR 007 959

AUTHOR	Parker, Lorne A., Comp.; Riccomini, Betsy, Comp.
TITLE	The Telephone in Education. Book II. Annual International Communications Conference (3rd).
INSTITUTION	Wisconsin Univ., Madison. Center for Interactive Programs.
PUB DATE	77
NOTE	204p.; Legibility varies; For related documents, see IR 007 958-962
AVAILABLE FROM	Center for Interactive Programs, 975 Observatory Drive, Madison, WI 53706 ($15.00)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Case Studies; Communication Satellites; Diagrams; Diffusion; *Educational Technology; Higher Education; *Information Networks; Media Research; Telecommunication; *Teleconferencing; *Telecourses; *Telephone Communication Systems

ABSTRACT

This report of a conference on the use of telephone technology in education includes 33 papers which deal with such areas as the use of the telephone in the administration of a telephone network or conference system, support services, program evaluation in telecommunication, program planning, teleconferencing, computer control of teleconferencing, agricultural extension programs, professional continuing education, teleconferencing in the Public Service Commission, experiments in Canada with the communications technology satellite, telecourses, instructional design, and innovation and change in higher education. Several case studies are included. (CMV)

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Third Annual International Communications Conference

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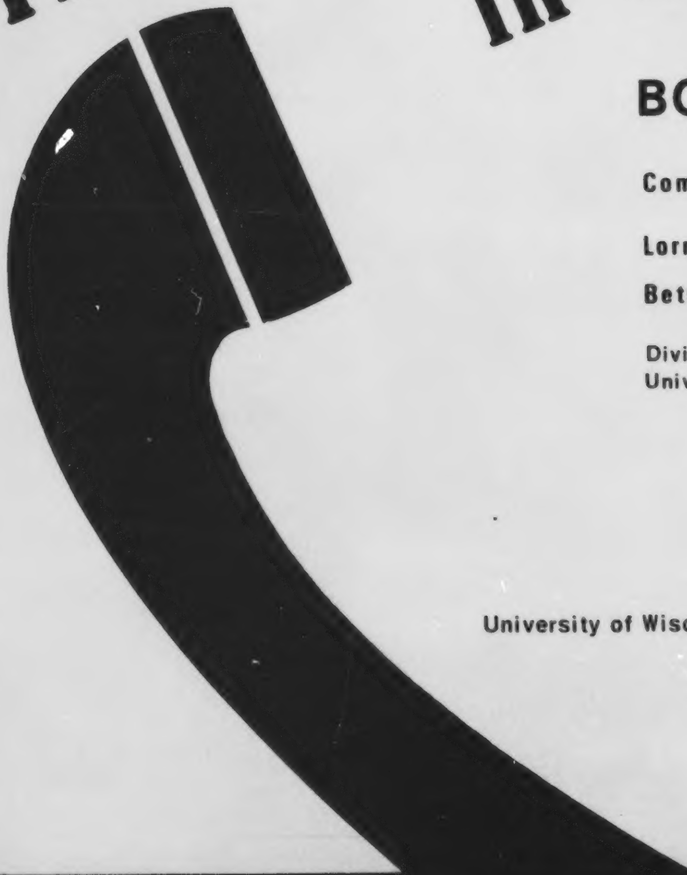

BOOK II

Compiled by

Lorne A. Parker

Betsy Riccomini

Division of Educational Communications
University of Wisconsin–Extension

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ADMINISTERING A TELEPHONE NETWORK OR CONFERENCE SYSTEM

Luke F. Lamb
University of Wisconsin-Extension

Administrative Philosophy

In order for any telephone conferencing system or network to be effective there must be an appropriate administrative philosophy within the sponsoring organization. This philosophy must first of all be based on a service concept for the various clientele groups to be served. There must also be a willingness on the part of administration to use nontraditional methods in reaching various audiences. Finally there must be a commitment to develop enough programs to achieve a critical mass through which cost effectiveness can be accomplished.

Administrative Committees

In setting out to establish any kind of telephone system it is important that the various parties who will ultimately be involved in the functioning of the system be included in advising on its make-up and operation. At least three types of personnel should be included in any advisory committee.

1. Producers: These are representatives of the programmers who will use the system.

2. Delivery Personnel: These are the representatives of the unit responsible for operating the delivery system and can include whatever technical personnel might be required.

3. User Representatives: If possible, this group should include representatives of clientele to be served. When this is not feasible it is suggested that this group include institutional representatives at the using end of the system. This might be anyone who is associated with handling the promotion or is responsible for a listening site.

The purpose of the advisory committee is to look at the needs of the clientele and the program producers and to recommend an appropriate delivery system and operating procedures.

Organization

There are basically two ways of approaching the organization of the telephone network system. Assuming a relatively small operation, the system can be incorporated into an existing organization as a sub-unit. However, once the delivery system reaches a reasonable size, it is then appropriate to consider setting up a separate operating unit. In either case, the organization should contain certain sub-units with assigned responsibilities:

1. Administration: The administration is responsible for long-range planning, contact with program units, contact with using locations, and overall supervision of operations, budget control, and system modification.

2. Planning and Design: This sub-unit is responsible for working with program producers to assist them with planning their program, designing it properly, and ultimately evaluating its effectiveness.

3. Program Production: Program production personnel are responsible for working with programmers to produce their programs and, where other forms of material are included, help the programmers package their materials for distribution.

4. Program Traffic: This sub-unit is responsible for scheduling the network, assigning times to programmers, notifying receiving locations of programs scheduled, and coordinating the availability of the receiving locations.

5. Technical Development: Technical development personnel are responsible for establishing the basic technical components in the system, recommending improvements in either distribution or receiving equipment, and keeping the system current with the state of technology as it improves and evolves.

6. Technical Operations: Technical operations personnel are responsible for the day-to-day operation of the system, making certain that programs are provided as scheduled and assuring that a high quality is maintained throughout the schedule. This sub-unit is also responsible for handling any trouble-shooting necessary on the system.

Operating Procedures

Before a delivery system can operate effectively there should be a set of standard operating procedures designed to assist programmers in the effective delivery of their programming. Listed below are a number of areas that need to be considered when establishing operating procedures:

1. Program Design: Many program-design techniques for telephone program networks have been developed over the last 10 years to develop and deliver programs more effectively. Experience suggests that both the programmer and the student receiver will be more satisfied if the material is properly packaged for effective use of the telephone system. Specific program-design techniques can be developed for use by program producers. These must be developed well in advance in order to provide a reasonable planning period.

2. Promotion and Publicity: Once the program concept is designed and in the production stage,

effective means of notifying the using clientele need to be incorporated in the operating procedure. Depending on the nature of the clientele, there are a number of standard approaches that can be used for promotion. Experience indicates that one of the most effective ways to reach clientele involved in a broad geographical delivery system is to incorporate the receiving locations in the distribution of promotional information. Promotion designed to be used with mass media is more likely to be utilized if it reaches these media from a local source rather than from a state or regional point.

3. Registration Systems: If the intended program clientele will be receiving some form of credit or paying fees for their programming, a registration system must be developed. It is usually more effective if this system can be centralized with standard forms used at the various registration points, but all forms should funnel back to the central point for recording of data, fees, and other information. It's important that enough copies of registration materials be provided so that all parties involved can receive copies. Obviously, the student needs a copy so that he or she realizes the registration has in fact been recorded and a listening location assigned; the producing department gets a copy so that it will know the number of students participating and their locations; the delivery system operating units needs a copy so that it will be aware of the locations to be used; the receiving location gets a copy so that the receiving location can be prepared for the number of anticipated students; and the records unit needs a copy in order to record any credit that may be attached to the program and to verify fees.

4. Student Advising: If possible, it is helpful to incorporate a student advising aspect into the telephone delivery system. This can be handled in a number of ways. If there is a central student advising system for the parent organization this can certainly be utilized. If there is control of the receiving locations by staff of the organization, then these personnel can be helpful to students in helping them select appropriate programs for their own needs. Finally, it is often possible to seek help from advising programs of local institutions of higher education.

5. Local Program Facilitators: One of the most important aspects of the total telephone delivery system is making certain that the clientele using the various receiving locations is in fact able to make maximum use of the system potential. It is important, therefore, that in each geographical area someone be charged with the responsibility of overseeing all local receiving locations. This person in turn has the responsibility of seeing that each location with students assigned is open and operating, and that equipment is functioning. This local program administrator is also a good point of contact for distributing promotional information in each local area. Staff professionals are usually assigned the local program administration role. Funds should be provided, however, to hire part-time aides to assist with the actual operation of each local facility.

6. Space: Receiving locations can be located in many different types of facilities. If the delivery system is to be utilized for programs for which a fee is charged, it is important that the listening locations be under the control or influence of the parent organization. Depending on the level of activity, it is often important that the listening locations be dedicated to the telephone programming function only. This helps assure that there are not conflicts with other activities requesting use of the same space. Different types of receiving locations can function effectively. Locations such as institutions of higher education, county courthouses, libraries, and churches can provide usable space.

7. Program Support Materials: Although a telephone network does provide for interaction between teacher and students, it is still frequently advisable to provide other materials to the student for use during the program. This may be as simple as a few sheets of printed material to be referred to while the teacher is speaking. It might be slides to be viewed by each local group, or it could be a television video tape to be viewed and then discussed with the teacher via the telephone delivery system. Whatever the form of the program support materials, it is important that during the design phase these be identified and produced. This will allow adequate time to deliver them to each receiving location and to have them available for the student when the program is transmitted.

System Design

Once a programming need has been identified and target audiences located, then the telephone delivery system must be designed in cooperation with the telephone company.

1. If the system will be operating in an area where there are a number of telephone companies, it is important at the outset to identify the major company involved and arrange for that company to act as the interface with all others that will be utilized.

The major phone company plays a very important role in working with the operating unit to design the system and to determine the network configuration and the types of long lines that will be required. A four-wire system is needed for good quality.

Depending on the scope of any system, it may be possible to utilize excess lines available from state and/or Federal telephone networks operating in the area. It is important to explore this possibility because the cost of buying into already existing telephone network packages will be considerably less than buying lines directly.

2. Originating equipment and facilities are comparable to those used in broadcast radio. A number of vendors are available to provide this type of equipment. Keep in mind that good broadcast-level equipment is important in order to maintain quality standards on the system.

3. Special receiving equipment is necessary in order to make maximum use of a four-wire delivery capability. Equipment incorporating a push-to-talk microphone system and a reasonable-size speaker is important. The size of the speaker will dictate the number of students who may participate at one time. Flexibility should be built in to allow for adding additional microphones when accommodating larger groups. Receiving equipment

can usually be purchased outright or leased through the cooperating phone companies.

4. Production equipment is also similar to that utilized in broadcast radio. Again, it's important to stay with a broadcast radio standard in order to assure that the programs produced will maintain a high quality. There are a number of sources for procuring quality production equipment.

Throughout the designing of the delivery system it is imperative that a close working relationship be maintained with the cooperating telephone companies. Design of the network and the acquisition of the interface equipment can be much more effectively accomplished through close cooperation with these telephone companies. They are also in a position to frequently advise on origination and production equipment as well.

Fiscal Considerations

It's difficult to suggest a general cost for a telephone network or conferencing system. Obviously the cost will vary depending on the complexities of each individual system, the type of origination, and production equipment involved, and the type and number of receiving locations. There are, however, a number of fiscal concerns that should be kept in mind as any system is developed. Some of these are as follows:

1. One-time only capital funds will be needed to secure production and operation space and equipment. The operations center will ideally be located in space similar to that provided for a broadcast radio operation.

Depending on the nature of the receiving sites, there may be a need for small amounts of capital dollars to modify receiving sites to better prepare them for satisfactory clientele use. Originating and production equipment will be an initial expensive item. Keep in mind that in order to maintain a high standard it is suggested that enough capital dollars be provided to acquire broadcast level production and origination equipment.

Receiving equipment can be acquired in at least three ways: (1) directly through purchase; (2) through a lease arrangement with the participating telephone companies; (3) if funds are available for acquiring the equipment outright, the following alternative may be explored. It is often possible to work out an arrangement whereby a five-year lease can be paid in a lump sum. At the end of the five-year period the total cost of the equipment is paid off and subsequently only a maintenance charge is assessed. There is usually a decided dollar advantage to this approach rather than the annual lease arrangement.

2. Operating funds: A number of ongoing expenses will be incurred in operating any system. These usually fall into such categories as salaries for full-time and part-time employees; supplies to cover the annual rental of phone lines and the acquisition of materials, parts, etc; travel funds to allow for maintaining the system and continuing relationships with receiving locations and external origination programming units. A small amount of capital dollars should be provided on a recurring basis to handle replacement of equipment that wears out or becomes obsolescent and to make minor additions to the system in order to maintain a state of the art capability.

3. Cost recovery: Depending on the policy of the parent organization, it may be possible to recover part of operating costs through charges made to users of the system. If no charge is made for using the system itself, it may still be appropriate to charge for the development of nonsystem materials such as tape packages. Charging for the production of materials of a nonbudgeted nature may also be appropriate.

Evaluation

There are basically two types of evaluation that should occur in any telephone delivery system. First, a program evaluation should be conducted periodically of the programming that is delivered over the system. The approach used here is very similar to the approach used on any kind of program evaluation and is basically to determine that the program objectives are in fact achieved. As a part of this type evaluation it is possible also to determine the satisfaction of the clientele with regards to the system itself. This is important in helping the staff determine ways in which to improve the system either technically or operationally.

The second form of evaluation is to determine the cost effectiveness of the system. Because of many uncontrolled variables, this is often a difficult thing to accomplish. Nevertheless, even when subjective, it does give an indication as to whether or not the system is worth the cost. Some of the things frequently examined are whether or not the delivery system allows for programming that could not be accomplished otherwise. Such things as timeliness of the information being delivered dictate that a rapid system be used. Another factor is the geographical consideration, particulary for larger systems. Here one looks at the clientele spread and the capability of delivering programs on a cost-effective basis to small groups of clientele spread widely throughout a large area. It is important to look at the capability of uniform program availability to all clientele regardless of location. Remote or rural areas should have the same access to programs as the more urban or populated centers.

The effectiveness of any nontraditional delivery system will in a large part be determined by how well it is administered. Administration of a system establishes the close working relationship among the originating programming departments, delivery system personnel, and those personnel working directly with clientele at the receiving locations. Proper administrative leadership is essential if the operating unit is to orchestrate all the various pieces into a comprehensive and effective telephone delivery system.

NUTS AND BOLTS:
LOCAL ADMINISTRATION OF AN INTERACTIVE TELEPHONE NETWORK

By Eugene Cibas, UW-Extension
Continuing Education Agent and
ETN/SEEN Local Program Administrator

Many of the discussions you will read or hear in connection with the Third Annual Conference on The Telephone in Education will either deal with fairly theoretical questions concerning the design of instruction for an interactive network or will treat the establishment and operation of an interactive telephone network from the perspective of central administrators of such systems. In this brief and low-key paper I will list the field operational problems you should address from the very first moment in planning your interactive system, and the Wisconsin solutions to those problems, as seen by a Local Program Administrator concerned with large enrollments of happy and well-satisfied participants. I will assume that you hope to extend non-credit continuing education programs to a broad variety of adult clientele groups, from 7:00 a.m. to 10:00 p.m., Monday through Saturday, all year long, and that you will not be able to achieve a level of funding that will enable you to buy your way out of the following problems:

1. You have to find appropriate rooms all over the territory you plan to serve. Those rooms should be available for use and secure during all planned program times. You should have use of the facilities free-of-charge or face crushing rent and custodial charges. Outlets for one site should be in one or more rooms in one building preferably on one floor unless there are elevators. The loyalty and enthusiasm of local collaborators fade when the equipment must be lugged from one building to another.

2. You will probably want to design programs whose audio elements are supplemented by visual materials such as slides, overheads, films, and a variety of printed materials. Somehow, the printed materials and slide-overhead-, and movie-projectors will have to appear in your dozens or hundreds of interactive classrooms at precisely the right time and will have to be removed and secured when the class is over.

3. You will have to publicize and promote both the medium and individual offerings. In all probability you will not command enough dollars to purchase, mount, and maintain an advertising effort that will sell both the medium and the offerings to all those busy and elusive folks you would like to attract.

4. You will need a way to post signs in buildings directing enrollees to the equipment, to register persons attracted to your programs, to be sure rooms are unlocked especially during evening hours and on weekends, to orient participants to the use of the equipment especially talking back, to catch wind of dissatisfaction with instruction offered, to relay requests for additional instruction, to discover and remedy equipment malfuction, and to deal with a whole host of pesky human, educational, and technical problems that will surprise you from time to time.

5. It follows that you will have to identify and enlist the cooperation of some category of responsible individuals who have a general committment to continuing education and can oversee the operation of each of your outlets. You cannot rely on persons or institutions interested in only one part of your programming effort. Ideally, you will identify a category of responsible field representatives who will donate and not sell their time to you, especially if your funding turns out on the lean side.

6. You must devise an absolutely reliable procedure for scheduling programs and communicating the announcements of those programs to your Local Program Administrators with ample lead time so that they can make all the arrangements outlined above.

If you fail to address and solve these basic problems in the initial planning stages of your interactive network, you invite a great number of frustrations for yourself, but worse yet for your participants. Failure to think through the local administration of the interactive network could give your ETN a bad name and set its acceptance back by several years. Poor attendance could even jeopardize your funding especially if it was grudgingly and provisionally granted.

Apart from inadequate enrollments because too few of the target clientele heard of the program, you will learn to your regret that some group could not find the classroom, the classroom was locked, some other group was scheduled into the interactive classroom on the third evening of a five evening ETN, some group of participants did not receive the mimeo-handouts, or the slides or the projector was not there, or there were three freeloaders at site X, or the equipment did not work because it was plugged into the wrong circuit jack or simply was not plugged in, etc. An interactive network is one of the best laboratories to prove the validity of Murphy's Law, ie, if something can go wrong it will. And things will go wrong in spades if you only think about your system from your perspective at control center.

Instructional Communications Systems of U.W. Extension solved nearly all of the field problems associated with operating the Educational Telephone Network and the Statewide Extension Education Network by forming a partnership with UWEX's Cooperative Extension Service, i.e., the statewide County Extension offices. These offices are staffed by faculty programming in Agriculture, Family Living Education, Youth Development and Community Resource Development. Since County Extension Offices are viewed as gateways to the resources of the whole U.W. System, the County-based Extension faculty welcomed the addition of ETN (and later SEEN) programming to the educational opportunities they extend to the public. In the faculty of the county Extension offices, ICS discovered a category of responsible individuals with a general committment to furthering adult continuing education. In addition to the types of agents mentioned above, ICS tends to rely in the major urban areas on the generalist Continuing Education Agents who are usually officed at U.W. two year campuses.

This partnership solved to a great degree the problem of finding suitable free, secure, and accessible space for the ETN and SEEN classes. All the County Extension agents have access to offices and classrooms either in the County Courthouse or in an annex to the courthouse or in some other county building. These faculty schedule a variety of groups into their facilities for instruction throughout the year. The Continuing Education Agents who are based on two year campuses and serve as outreach officers for those campuses, are constantly scheduling space for a variety of conferences, classes and workshops. In both the county office and two-year campus setting providing spaces for ETN participation fit in nicely with other on-going activities for which all the necessary arrangements and understandings were already in place.

The same sort of arrangements and understandings were in place with regard to the delivery of audio-visual to Extension activities. Each county office had or acquired the Kodak carousel slide projector, the handiest AV equipment to show the slides which have turned out to be the AV material most commonly used in support of ETN/SEEN classes.

County offices also count overhead projectors and 16 mm movie projectors in their stock of AV equipment. The Continuing Education Agents, based on two year U.W. Center System campuses, have access to all the audio-visual equipment owned by the Centers, were scheduling this equipment for use with other Extension activities and found it no problem to extend this arrangement to support ETN/SEEN classes.

Up to this point you may have been forming a confused picture of a variety of agents taking partial responsibility for local ETN/SEEN administration. Early in the game ICS and the County Extension Staffs realized that ETN/SEEN responsibility would have to be assigned to a specific individual at the local level to insure total coverage. Thus each year the Extension District Directors began to designate one agent for each site as the Local Program Administrator. In county offices in the more sparsely settled counties, the County Office Chairman often serves as the Local Program Administrator. In the more populous areas the Extension Continuing Education Agents, who work in programming areas not covered by the four traditional county faculty types, serve as Local Program Administrators, usually for a number of ETN/SEEN sites. Very early it was also discovered that other conflicting duties of the Local Program Administrators made it impossible for them always to carry through on all the details of Local administration. So it was necessary to hire limited part-time paraprofessional aides, called Local Program Aides, to assist the Local Program Administrator.

ICS and the County Extension Local Program Administrators also quickly discovered the absolute necessity of channeling all information regarding upcoming ETN/SEEN programs through a central program coordinator at ICS who was clearly identified as the Local Program Administrators and could demand complete program information for all local Administrators 60 to 90 days in advance of the start of a program. From our experience in Wisconsin we can say that if you allow your resource base to schedule time on the network and pass program information out without channeling that information through a central program coordinator, the system will break down. Subject matter specialists tend to be highly involved in the design of a program and somewhat less interested in the mundane, practical problems and requirements of scheduling, promoting and administering their programs at the local level. Consequently they often fail to provide LPA's with adequate and timely information.That adequate and timely information is just as important for promotion and publicity of programs as it is for scheduling rooms, supportive AV equipment, and getting mimeographed supplementary materials into rooms at the times they are needed. Publicity for programs is handled in the following ways: UWEX public information creates press releases and radio spots for each program and mails them with adequate lead time to the Local Program Administrators who localize them and place them with area newspapers, shoppers' guides, and radio stations; ICS collaborates with the entity creating the program to draw up a brochure to be mailed to select known clientele; each semesters ETN/SEEN offerings are set out in an attractive tabloid of which tens of thousands of copies are run off, mailed to former participants and distributed by the County Extension Offices and the Campus-based Continuing Education Agents in their mailings; all County faculty announce these programs to appropriate groups of potential enrollees in conjunction with other Extension activities. All this can happen only if a central coordinator is in a position to press the program designers for adequate, detailed advance information.

But this is only part of the story. There are some other considerations that will have a real effect on the amount of time it takes for the various clientele groups to become aware of your service, realize its value to them, and begin to participate. You should decide early on whether you will be able to achieve a level of funding that will enable you to always advertise your offerings or whether you will solicit free advertising by sending out press releases announcing your courses. It takes a few years for local papers to reach a point where they consistently print your press releases. If you shoot out paid advertising from time to time, your local contact on a newspaper may begin to ask why he or she should continue giving you free space, especially if other letter funded educational institutions consistently have money for paid advertising.

When you are brand new, it is crucial that your publicity have a strong local identification with some educational institution that is accepted and understood. Unfamiliar materials with a distant post mark and source identification, such as Madison tends to receive a few milliseconds of attention prior to filing in the waste basket in Wausau. And remember you will always be brand new to a huge percentage of the general public.

As an Extension Continuing Education Agent I recently had dramatic evidence of how important local identification of materials is to enticing people to read the ETN/SEEN tabloid. In September, 1976, I wrapped the ETN/SEEN tabloid around thousands of my own program announcements of fall non-credit classes in the Arts and Humanities. The tabloid's masthead prominently displayed the words: Instructional Communications Systems, Observatory Drive, Madison, WI. Half of my own programs failed and I received many calls asking when my fall programs would be announced. It seems that people saw the Madison identification 110 miles distant, and simply popped the whole package into the wastebasket. I now wrap the ETN/SEEN tabloid inside my locally accepted and known programs, even though the Spring, 1977 tabloid carries the words: "Programs Brought to Your Community..." This happened after five years of intense ETN/SEEN promotion in my area.

There are a very few types of target groups who are not affected by the lack of local identification on a program announcement. These are usually professionals such as lawyers or pharmacists who may have a state imposed requirement to do a certain number of continuing education hours of professional development each year. Such individuals do have the motivation to read through a brochure regardless of whether it seems to promise a local or a distant opportunity. Provided that is, the piece gets by the secretary who might be doing a bit of selective pruning. In general, any institution contemplating the establishment of an interactive system as ambitious in the diversity of its offerings as Wisconsin's is should consider hiring someone with a sales and advertising background with a dash of systems analysis to serve on the central management team with responsibility to thinking about marketing, advertising and selling the product of your organization: educational experiences.

Paragraph four, which lists the main local program administrative problems which should be considered from the beginning of planning your system, carries a number of points which do not need elaboration: posting signs, unlocking rooms, orienting participants to the use of the equipment, and reporting and requesting repair of equipment malfunctions. These are small but crucial duties. If they are not flawlessly carried out at every outlet, they become big headaches for mission control. Registrations are sent to ETN/SEEN registration who then sends yellow slips confirming registration and payment of fees to the Local Program Administrator.

Other more significant but no less crucial aspects of local administration of programs are gathering feedback on the quality of instruction and advice on sequels to current programs or needs for other programs. Extension's Local Program Administrators and Aides are ideally placed and motivated to become aware of participant reaction to the format, scope and quality of programming. Extension County Faculty are trained in educational techniques and can offer professional critiques of the quality of instruction being offered. Both they and the Aides tend to take pride in "their" ETN/SEEN programs and will not let an inferior offering, which is being perceived as such by the enrollees, go on without making strong complaints to ICS Central. We want to be respected and supported by the local community. Extension's County Office Faculty, by virtue of their knowledge of many aspects of a community's educational needs and interests, also make an excellent advisory committee for future program planning.

In broad brushstrokes, this is how the Instructional Communications System-Cooperative Extension partnership works in Wisconsin to make a success of the local administration of ETN/SEEN programming. Who will you form a partnership with?

SUPPORT SERVICES

David L. Jensen
Director, Student Services
University of Wisconsin-Extension
Madison, Wisconsin

Services such as registration, counseling, student records, and financial aids are all too frequently considered as isolated functions. Not enough attention is given to the integral role that they play in insuring the efficacy of continuing education programs and enhancing participant satisfaction.

Most continuing education institutions neglect to properly emphasize the student orientation in their support services. Personnel having responsibility for these functions should have an understanding and appreciation for the needs of the adult student, the role of continuing education, the importance of client rather than institutional priorities, and the willingness to be flexible when necessary.

Making decisions based on a desire to be of assistance to program participants seems, on the surface, to be quite natural. Many offices in continuing education institutions, however, don't work directly with clients and oftentimes get hung up on receipts, deposits, regulations, systems, procedures--all means to ends that too frequently become ends in themselves. Support staff not encouraged to keep client priorities and institutional priorities in perspective become unwitting contributors to an improper orientation.

It is but a subtle difference in attitude. If not emphasized, however, you stand a good chance of having: 1) receipts deposited while registrations remain unconfirmed, 2) impersonal relationships with registrants, 3) counseling programs that encourage recruitment over counseling or support for institutional sanctions and traditions rather than adult participant needs, and 4) an unimaginative pursuit and utilization of financial assistance.

A proper focusing of support services attendant to telephone network programming is no more difficult to obtain than in programming using other delivery systems. Fundamentally, it simply requires the "client first" mindset described previously. Once attained, staff are likely to establish their personal objectives in support of a primary responsibility that seeks to maximize participant benefit from learning experiences. They recognize the potential feeling of isolation that the learner by telephone can feel; the damaging effect that geographical separation can have on the social supplement to educational activity. They respond by helping instructors and local program administrators to cultivate an appreciation and proper use of this delivery system by participants.

Student Services at University of Wisconsin-Extension has responsibility for the support services--registration, counseling, student records, and financial aids. Since Student Services has been designated the unit to serve as student advocate, it has been relatively easy to engender the proper attitude in carrying out our activities. As we perform these functions, we do make a conscious effort to look at participant needs.

With each of these functions, there are particular considerations related to learning experiences by telephone to which we attach especial importance.

Registration

Consider the following characteristics when establishing your telephone network registration system:

Uncomplicated

Identify the tasks to be accomplished and develop a procedure to adequately carry them out while carefully limiting data collected to that which will be used. Avoid the use of unneeded forms and involve only those offices and people required to carry out identified tasks.

Information is important to effective decision-making. Consequently, when there is doubt about the usefulness of various information, it is, unfortunately, normally collected. Keep in mind that gathering data is expensive, that it can unnecessarily complicate registration by encumbering forms, and can generate undue processing (e.g. Family Educational Rights Act of 1974).

Compatible

Telephone networks are but one delivery system amongst many in institutions providing continuing education. The registration procedure should at least be compatible with those of other delivery systems if not identical; especially with regard to the forms used and the information requested. This consideration is particularly cogent if records generated from registration data are maintained on computer. In high volume operations, data entry and maintenance of auditable files is much more efficient if the input device is the same for all registrations.

"Need-To-Know" Communication

Be sure that those with whom you share registration information need to know in order to provide proper service to participants. It is costly sending data to those who think it is nice to know, but don't need to know.

We feel that registration information is required as auditable backup for deposit of receipts, as confirmation to the participants (dates and times of sessions, telephone network location, name/telephone of local contact, receipt for payment, description of telephone system) as notice to coordinator, as notice to local program administrator, and as input device for student records. A copy of the form should be provided to each user to avoid delays in circulation.

Planned Processing Time Frame

Day-to-day processing of registrations is not always possible, especially in high volume operations with peaks and valleys. Program schedules based on multiple starting dates facilitate best use of staff time. The tendency, however, is to peak program starts at the beginning of academic periods (semesters/quarters). The pressure is considerable and frequently requires part-time help.

To the extent possible, establish registration schedule to provide registration information to those who need to know in timely fashion (e.g. coordinators must send materials out before program begins).

We have found it beneficial as a rule of thumb to process registrations two weeks before program initiation, again one week before, and last-week registrations on the day received. Information on registrations processed within forty-eight hours of the program is given over the phone to those who must respond.

Last-Minute Update

It is a good practice to announce registrations (numbers and locations) over the network the day each program starts. In this way, coordinators and local program administrators will be assured of up-to-date registration information. This is critical for low volume locations that might be turned to other uses if unaware of registrations.

Walk-In Registrations

Identify a walk-in registration procedure for local program administrators. Provide a system that registers the walk-in without hassle and allows the local program administrator to do little more than transmit money and information. The LPA has significant responsibilities and must not be forced to be an active extension of the registration office.

Educational Counseling

Participation in a learning by telephone program is frequently only one of a number of required or desired educational experiences in meeting personal objectives. Many pursue telephone learning because it is accessible and most adequately allows them to circumvent barriers of time and distance in their pursuit of continued education.

The telephone network in Wisconsin can supplement the attainment of a variety of educational objectives:

- credit class experiences as part of standard college degree programs at both bachelors and masters levels;

- preparatory and supplementary experiences related to external degree components--learning contracts, credit by examination, independent or correspondence study, assessment of prior learning/portfolio preparation,

- programs to prepare participants for GED examinations,

- sessions for social work and teacher interns to articulate practicum experiences with theory,

- programs to meet recertification/relicensure requirement of various professional groups, e.g. nurses, pharmacists, lawyers, engineers;

- awareness/response programs for individual and groups involved in discussion of and response to important problems and issues such as energy, environment, and community development.

These examples are by no means exhaustive, but they do exhibit the array of educational endeavor in which telephone learners are involved. Many of these people benefit considerably from counseling services by helping them to define personal educational objectives; to understand and overcome impediments to continued education such as time, distance, finances, and personal handicaps; and to aid in the selection and involvement of programs and institutions that help meet objectives.

A counseling effort to assist the telephone learners should have the following characteristics:

Objective

Counseling should look first to a participant's needs and objectively identify appropriate programs and institutions. The desirability of additional participants either on your telephone network or in your institution should be a secondary consideration. If your counselors are not allowed to separate these considerations, they will more accurately be referred to as recruiters.

Accessible

To be effective, counseling should be readily available--not, however, by correspondence. Our experience has been that concerns of adults continuing education are varied and complex. Consequently, considerable time is often involved in each session. We have found correspondence relationships wholly inadequate.

In Wisconsin, we use community-based counselors located in libraries, courthouses, museums, and other sites away from campus and convenient to the public. Presently, they serve approximately 130 communities in various sections of the state and are as accessible to telephone network participants as to anyone else.

Publicity

Be certain that telephone program participants are aware of the counseling service, that they understand the program's objectives. Many don't believe counseling to be needed until they recognize the variety of helps it can provide and know how to avail themselves of it.

Knowledgeable Counselors

Mentioned earlier was the fact that properly oriented counselors will need to deal with learning objectives, barriers to involvement in education, and the whole array of available educational programs and institutions. It is difficult to do, but counselors should generate considerable knowledge in these areas and have good relationships with resource people to provide essential detail when necessary.

Considering the variety of learning situations that can be potentially presented by telephone learners, counselors will need access to information on 1) requirements for learning objectives from GED through PhD; 2) educational requirements for various careers; 3) assistance for combating personal barriers to continued learning such as financial aids, distance learning opportunities, helping services like vocational rehabilitation; and 4) knowledge of programs of all types that could prove useful to clients, including basic and remedial learning experiences, vocational/technical programs, and college/university degree programs.

Student Records

Link student record requirements to registration procedure to take advantage of single data collection point. Data requirements can generally be met, except for completion status, with the registration input. Every effort, therefore, should be made to assure that the records office is included in the plans for data flow of registration information.

In UW-Extension programming efforts the Continuing Education Unit (CEU) has become the predominate measure of participation. We recommend that you give consideration to the following concerns in your utilization of CEU's on the telephone network:

Integrity Check

Establish completion requirements, even if only attendance, and insure that requirements have been met before awarding CEU's. This can be difficult on the telephone network due to distance between instructor and learner, but properly functioning local program administrators can facilitate this process. Avoid granting CEU's for payment of fees.

Program Eligibility

The National Task Force on the CEU has established guidelines to insure quality of CEU programs. Telephone programming in no way inhibits the development of program within these guidelines. Don't let your institution stifle distance learning opportunities because of vague notions about attenuation of quality.

Award To All Who Earn

The significant volume of participants in some telephone programs can lead administrators to award CEU's to only those who request them. The newness of the CEU has, unfortunately, brought on delayed recognition of relevance for many program participants. Scrambling for information when records are not retained proves more difficult and time consuming than maintaining records on all those who earn.

The "all-who-earn" approach establishes a more effective routine for student records, provides a continuing relationship between participants and institutions, and presents a more satisfactory picture of institutional impact, e.g. number of people completing requirements of continuing education programs rather than the number who paid the participation fee.

Financial Aids

Advocate

Be spokesmen for financial assistance to support the continuing adult student. Financial aid decision-makers need to be disabused of the notions that 1) only the 18 to 22 year old age group needs assistance, 2) employed people even though they have family and home obligations don't need assistance, 3) a standard college degree is the only educational objective worthy of assistance.

Seek Support

Continuing education administrators have made a case for formula support from government, but a positive response is not likely in the near future. We need to encourage support and seek funding from sources sympathetic to the need. Memorial gifts have been largely responsible for the modest program which we have.

Income Requirement Relief

Some programs are directed toward the needs of people who can't pay, or they meet the needs of society rather than those of the participant. Relief from normal income obligations and a well delimited ability to provide fee waivers provides potential for an extensive and effective financial assistance program for many adults who need help to continue their education.

SUMMARY

Procedures and regulations when given exaggerated importance leave support services as an ineffective influence on program efficacy. These functions and others like them will dictate this influence if you let them. Flexibility and innovation, so important in the continuing pursuit of effective and efficient ways of removing the barriers for non-traditional students, will be thwarted without strong encouragement of staff.

It would have been easy to say that registration complications preclude joining independent or correspondence study with telephone learning to enhance the impact of both. Difficulty in processing group registrations and its attendant problems in providing materials and planning for an unknown number of participants could have kept us from programming for Sunday school teachers. An unwillingness to accept a multi-institution base and its digression from normal registration and record practices would have discouraged other educational institutions from contributing to the array of learning experiences via telephone. Options for participants would have unnecessarily been limited.

As here illustrated, flexibility in support services is a must if innovation is to prevail in continuing education. Learning by telephone is an extraordinary example of this innovation in educational delivery systems. The spirit of those who are programming in this manner should not be dampened by those whose role is to facilitate.

Higher education is often accused of being too protective of its traditions. The rationale given--maintenance of quality. The limiting effect of support services almost never is based on quality; yet, it can be a very real impediment. The role that you as administrators give to support services will dictate whether programs will be supplemented or impeded by your support staff. Given a proper orientation, support services will be appropriately responsive and adaptable.

SEEN -- A CASE STUDY OF ENGINEERING EDUCATION BY WIRE[1]

By
Lowell B. Jackson, Director
Electronic Media Programming in Engineering
University of Wisconsin -- Extension
Madison, Wisconsin

Introduction

The delivery of instruction to students at locations near their homes or places of business is usually not justified economically if an instructor must travel great distances to serve a few participants at each classroom site. Broadcast media such as radio and television have proven to be effective modes of delivery for educational purposes in Wisconsin and elsewhere. Extension Engineering has provided instruction for the past three years by way of the Educational Television Network (etvn), via cable television, and through use of video cassettes.

While appropriate for some disciplines and subject matter, however, these essentially one-way systems have disadvantages for courses in which discussion and immediate feedback are required. Also, television-based systems are costly and/or lack flexibility to modify instructional material easily. These disadvantages have been avoided in many Extension offerings by use of the Educational Telephone Network (ETN), and the electrowriter network called SEEN (Statewide Extension Education Network).

The Educational Telephone Network (ETN)

Wisconsin's Educational Telephone Network, using leased commercial telephone lines and appropriate terminal equipment in a manner that allows interchange of audio information between all points in the network, permits origination or reception at more than 100 sites throughout the state. These locations establish points of access convenient for both off-campus students and those from other campuses. The network permits an economically viable class size, as small groups at the various sites are able to hear the instructor and each other as they would in a typical classroom. Very few engineering or math courses have been offered via the ETN system, mainly due to its exclusive reliance on voice communication.

Statewide Extension Education Network (SEEN)

In technical subjects, dependence is heavy on formulation, diagramming, and visual development. The desirability of the visual dimension not available by way of ETN led to the design and development of the Statewide Extension Education Network (SEEN).[2]

The SEEN system links more than 20 locations in Wisconsin (shown in Figure 1) with approximately 3500 miles of long-distance telephone lines. A four-wire arrangement permits two-way audio transmission that can be heard anywhere in the network, and also provides for the use of electrowriters[3] to supply the visual element. Equipment required in each SEEN classroom, in addition to the electrowriter receiver, consists of an amplifier-loudspeaker unit, a number of desk microphones, and a projection screen. The electrowriter receivers at all sites project simultaneously onto each screen the equations, line drawings, and other writings of the instructor at the transmitter.

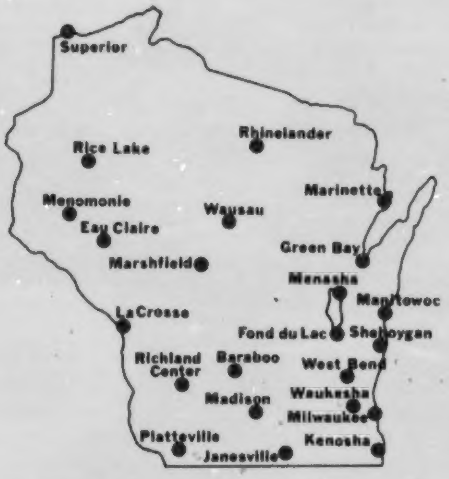

Figure 1 Location of SEEN Sites in Wisconsin

SEEN transmitters are located on University of Wisconsin System campuses where engineering and math courses or other courses of interest to continuing engineering students are taught. The receivers are located directly on various campuses, in public buildings such as libraries and county courthouses, and in one case within a large manufacturing firm. Although the SEEN equipment locations are generally established on a semester basis, the units can be moved easily and reconnected at other locations as the need arises.

Administration

The administration and management of SEEN operations as they apply to Department of Engineering and Applied Science course offerings fall into three areas. Course design, faculty identification, and all other academic matters are managed by the Director of Electronic Media Programming in Engineering (EMPE).[4] The EMPE Director initiates courses and promotion thereof, and coordinates with other Extension departments such as Math and Business & Management concerning offerings of probable relevance to Engineering's clientele.

Management, maintenance, modifications, and coordination of the physical facilities such as telephone network, studios, classroom hook-ups, electrowriters, audio equipment, etc. are the responsibility of Extension's Instructional Communications Systems unit as a service agency. To a limited extent, the third branch of administration is provided by Extension agents headquartered in the areas of SEEN sites. With respect to their responsibilities in various instructional communications modes, they carry the title of "Local Program Administrator" and serve as the closest personal contact to the SEEN student.

The SEEN Student

There are three basic educational use categories within the SEEN system: (1) on-campus undergraduate and graduate students; (2) continuing education students in credit courses; and (3) continuing education students in noncredit courses.

On-campus Undergraduate and Graduate Students. Resident campus students are usually enrolled in SEEN courses which have been deployed statewide in order to effect economy. These courses, like on-campus classes, are customarily conducted during the morning or afternoon hours. Continuing engineering students may also enroll and take the course at any SEEN site. Basic courses in statics and dynamics for pre-engineering students, for example, are conducted at the 14 two-year campuses of the University of Wisconsin Center System. Instruction originates at the Center in Wausau and is received by about 50 students in groups of four or five at other Centers during a mid-morning hour. Although the time of day is not convenient for most continuing education students, several have joined this class.

Off-campus Continuing Education Students Enrolled for Credit. Although the late afternoon and early evening hours are most convenient to SEEN students in this category, some success has been met with a noon-time schedule, reflecting the employment times of the students. This is the type of course for which the system was originally conceived.

In many cases, the inclusion of working students at remote locations who are occupationally associated with the subject matter has added much to the relevance and scope of instruction. In such subjects as products liability, welding metallurgy, and pollution control, the experienced, working student has contributed a great deal to the course and has challenged the instructor to keep abreast of engineering practice.

Off-campus Continuing Education Students Enrolled in Noncredit Courses. Courses to students in this category may be SEEN courses or courses "simulcast"[5] in conjuction with Extension Engineering evening courses. These are usually conducted between 6 and 10 p.m. Monday through Thursday. Whereas credit courses usually span an entire semester, noncredit offerings are typically conducted over a six- to eight- week period. The offerings in noncredit continuing education tend to be more "state of the art" than credit courses, and have a much larger potential audience. The evolution of SEEN for engineers has shown a great increase in participation in these types of courses compared to credit offerings.

The Faculty

The instructional services for SEEN courses are supplied by three types of faculty: (1) members of the professional staff of Extension Engineering; (2) members of the teaching faculties, primarily in engineering, at 5 or 6 of the 27 campuses in the University System; and (3) members of the engineering and industrial community with appropriate experience and teaching expertise.

Those in the first category supply the bulk of offerings of the noncredit variety, dealing with subjects of current relevance in their areas of professional competence. These teachers are able to respond very quickly in program design to the changing aspirations of the continuing engineering studies clientele. Fortunately, the vocational advancement environment in the Department encourages participation in SEEN teaching as a substantial method of establishing credentials.

The SEEN courses offered for credit are generally taught by resident campus faculty. Such courses are adapted directly from existing courses offered to students on campus. Although it is not necessary, the courses offered by these faculty members are generally those simulcast to the network from a class of resident students. Teachers in this category have in the past been compensated by an "overload" payment in addition to their regular faculty salary, but now often engage in SEEN programming as a part of their regular academic activities.

Building upon the long experience of the evening course program of noncredit offerings based in Milwaukee, some of the SEEN schedule is devoted to simulcast versions of evening courses. The teachers of these may be from any of the employment categories discussed above. Those not on the staff of UW-Extension are as a rule compensated at an hourly rate.

Since the SEEN system began operation in 1969, more than 100 men and women have served on the SEEN instructional staff.

History of the SEEN System

The first SEEN course, a series of 13 sessions on an electrical engineering subject, was convened in 1969 at five separate locations with 19 students. An evaluation by teachers, students, and interested administrators led to planning for expanded use of this concept. During the 1970-71 academic year, a joint program of 16 courses at 12 sites was conducted by joining SEEN with a similar network operated by the University of Illinois. Under this sharing arrangement, resident and continuing education students located in the two states enrolled in the courses of their choice through their own university, without regard to the point of origin of the instruction. The first semester (fall of 1970) featured only daytime, simulcast, credit courses, which were provided primarily for graduate students in civil, electrical, and mechanical engineering, mathematics and computer science, mechanics, and minerals and metallurgical engineering.

During the 1971 spring semester, a number of noncredit refresher-type courses conducted during the evening hours were added. The joint programming effort between SEEN and the University of Illinois ended in the fall of 1971.

Table 1 (below) presents statistics pertaining to the SEEN program throughout its operational life. Since courses differ in length, in credit status, and in design relative to the contact hours required per credit, the unit of student endeavor known as the Continuing Education Unit has been used to represent the total time spent by the student on the course, including outside reading and study.

Table 1 SEEN Statistics, 1970-1976

Semester	Number CEU	Enrollees	Ave. Enroll/Course
Fall, 1970	652.8	77	7.0
Spring, 1971	1202.0	157	17.4
Fall, 1971	938.8	76	6.3
Spring, 1972	827.3	88	11.0
Fall, 1972	1324.1	181	15.1
Spring, 1973	936.8	137	15.2
Fall, 1973	906.0	153	17.0
Spring, 1974	1168.6	295	29.5
Fall, 1974	926.1	271	22.6
Spring, 1975	1349.0	400	36.4
Fall, 1975	933.6	183	22.9
Spring, 1976	1051.5	273	24.8

Experience and expert projection indicate that the Engineering portion of the overall SEEN use can be expected with good management to maintain an average level of activity per semester characterized by about 1000 CEUs, generated by about ten courses, each with about 25 students enrolled.

Selection of Titles and Faculty

The establishment of a SEEN schedule each semester requires consideration of several independent elements:

1. The availability of the desired time on the network.
2. The time a course is scheduled on the originating campus, if the course is to be simulcast as a credit offering or as an evening course.
3. The willingness of a faculty member who is adept at this kind of instruction to offer his course in the SEEN mode, and the encouragement of his dean or chairman and colleagues.
4. An accurate determination of educational needs from continuing education clients and providers. This is accomplished in several ways: questionnaire surveys; voluntary suggestions from both instructors and students; advice from persons such as industrial training directors or those serving on various continuing engineering studies advisory committees; and spontaneous "targets of opportunity" that indicate a subject likely to be of current interest to a specific clientele. For example, close watch is kept on legislation which appears to require an increase in some technical skill or knowledge, such as a new uniform single-family housing code or a solid waste disposal law.

Promotion

The promotional strategy for SEEN courses, as for other Engineering Department formats, has been largely based on direct-mail announcements. Approximately 20,000 persons with Wisconsin postal (ZIP) codes, and a few in adjacent places like Dubuque, Duluth, and Rockford, receive brochures by virtue of inclusion on the internal mailing list maintained by the department. A few outside lists are also used.

There are 3 levels of direct-mail notification employed: (1) an annual directory, listing all Engineering Extension offerings and describing the SEEN system along with other instructional elements; (2) a catalog of EMPE (SEEN and various television formats) courses, either on a semester or annual basis; and (3) monthly reminder brochures of upcoming EMPE programs, generally grouped in logical interest categories. The single course brochures are sent for special courses and serve as a positive reminder to those who have received the general announcement, particularly when a course does not begin until mid-semester.

Use is also made of more general promotional vehicles, such as an annual newsprint flyer of all ETN and SEEN courses offered by all departments of Extension and published by Instructional Communications Systems. Newspaper ads and public service TV spots have also been employed on occasion.

Of growing importance to promotion are the Local Program Administrators. Their local contacts with potential clientele are increasingly effective in generating enrollments, and their efforts are enhanced by special news releases prepared by Extension's Program Information unit for the LPAs' subsequent distribution to their local news media.

Evaluation

Until 1974, an evaluation form utilized for institutes and short courses served for SEEN as well. However, since the specifics of the SEEN experience are different from in-person instruction, a custom designed computer survey was employed beginning that year to query more than 700 former students about their reactions to SEEN courses they attended. Descriptive information about the clientele was generated as well.

The results indicated that the respondents have participated in a variety of educational activities in addition to SEEN; credit courses, 35 per cent; in-house courses, 75 per cent; university conferences, etc. 81 per cent; professional society courses, 51 per cent. The acceptance of SEEN as a delivery system was indicated by the fact that one in five participated in more than one such course, and seven out of eight would participate in a SEEN course again.

There appears to be relatively little age discrimination between 25 and 55 years and tuition and book refunds by the participants' employers were common. A summary of the 28 SEEN evaluation question responses is shown in Table 2 (below). (10 is the highest score on a scale of 1 - 10)

Table 2 -- Student Response to SEEN Courses

Subscore	Items	Mean	Reliability
Technical Aspects	6	7.55	.77
Lecturer	6	7.15	.84
Material Presented	5	7.17	.70
Program & Facilities	6	8.24	.58
Organization	5	7.10	.80
Total, 1 - 28	28	7.46	.92

Sample Size Reported = 282

Subsequent evaluations of individual SEEN courses (as opposed to all courses and the system itself) with substantial enrollments (greater than 50) have generally been very similar in all particulars. The questionnaires have been improved to show even higher reliability factors. Another system-wide evaluation update is to be executed in the spring of 1977.

Costs

Student Costs. In general, the criteria for establishment of tuition for credit courses has been to maintain a charge similar to that assessed at the campus of origin on a per-credit basis. The fees for non-credit offerings are now set at about $3.00 per contact hour, while credit fees average about $1.60 undergrad and $3.60 graduate per contact hour respectively.

Figure 2 indicates the tuition costs of the SEEN instructional format relative to others in Engineering. The figure also indicates the degree of self-study typically observed for each format. It is clear from the figure that a reduction in dollar cost implies an increase in individual intellectual effort. There are other costs to the student who must travel by auto to the SEEN classroom site. It is estimated that the average student travels about 25 to 30 miles round trip to each session.

As in the case of formats such as institutes and short courses, some, if not all, of a continuing engineering student's expenses are often refunded to him by his employer.

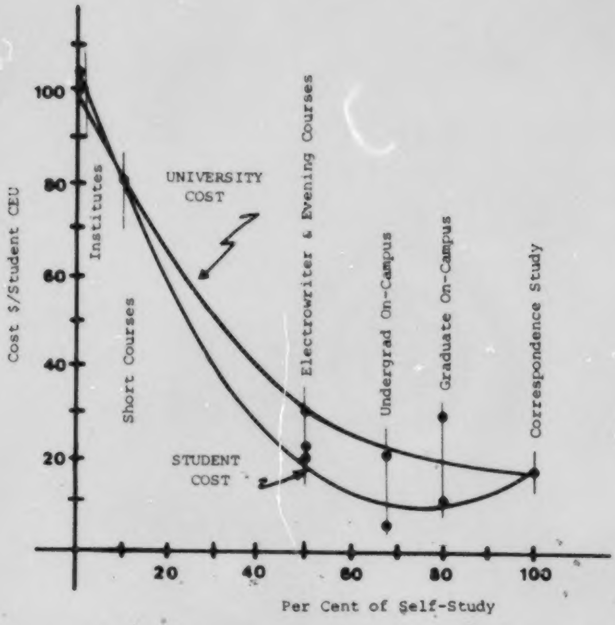

Figure 2 Relative Costs and Self-study

University Costs. The current cost to the University of Wisconsin System to conduct the Engineering portion of the SEEN system is estimated at about $30,000 per semester. This includes the value of all time, material, and equipment, whether or not it is actually charged to Extension Engineering. This is allocated as follows:

Administrative	$4,500 per semester
Promotion and Materials	2,500 " "
Instructional	8,000 " "
Hardware, services, line costs, maint., equip.	15,000 " "
	$30,000[6] per semester.

Income from student tuition to offset this cost equals about $12,500 per semester and is based on a semester of ten courses, in which an average of 25 students per course amass a total student activity of 1000 CEUs. A realistic maximum level of self-support for these programs is 40 to 60 per cent of the above costs.

Advantages and Disadvantages of SEEN

The most obvious advantage of SEEN is that in many cases the alternative would be no course at all for continuing engineering students. This fact tends to moderate student and faculty annoyance with some of the system's disadvantages.

There is no doubt that the problems imposed by the electrical and mechanical elements of a SEEN lecture require careful preparation by the instructor, good design and layout of the visual material to be presented one frame at a time, and conscious effort to include remote students in questions and discussion so that they will not be intimidated by the equipment or feel left out. Experience shows that use of the electrowriter tends to slow down the pace of instruction. Lectures must be more efficiently presented to compensate for this factor. Equipment malfunction has been lessened by a positive maintenance program, but occasional trouble in the system, such as a projection lamp burnout, still causes frustration and delay. Possibilities of replacement of electrowriters with more reliable equipment, such as the Electronic Blackboard developed for the University of Illinois are intriguing, but apparently more costly.

Another disadvantage of the visual aspect of SEEN is the limitation of the variety of visual presentation. Only chalk-board type information can be presented, and it may not be erased; the amount of material visible at one time to the student is relatively small, and it is not possible to point to an equation or drawing on a prior frame more than one removed from the one at hand.

The visual aspects of a SEEN course can be enhanced by providing supplementary sets of 35 mm or overhead transparencies at each site, but this imposes logistical problems on the system and is usually avoided.

Although the extra effort required of the instructor to teach the course through SEEN has been listed as a disadvantage, one could also argue that it is an advantage. The more meticulous preparation and presentation required reflect greater credit on the instruction. Mediated instruction of almost any variety has this characteristic.

SEEN and other mediated instruction modes capable of delivering upper level and graduate instruction to remote locations are recognized as a great advantage by industrial firms. Newly graduated engineers hired by these firms regard continuing educational opportunities as a valuable fringe benefit. One such firm, located more than a hundred miles from the nearest engineering campus, has installed a SEEN-equipped classroom inside its plant. This allows employees to participate in SEEN courses during the daytime hours without taking time away from work for travel to and from a campus-based site.

Future Directions

Opportunities for refinement of the SEEN system for Engineering programs are apparently concentrated in the areas of needs determination and promotion to increase enrollments, since the number of course offerings is limited by time available. Experience over the years has shown that daytime and Saturday programs do not attract sufficient continuing engineering education students to justify scheduling. There are other disciplines within the University which can more profitably use those times and they are beginning to do so.

The SEEN clientele are apparently satisfied well by the existing system. The teachers in particular have expressed the strongest arguments for changing the electrowriter in favor of equipment which is more reliable and capable of image recovery -- technically possible but expensive.

There are no current indications that additional requirements exist for undergraduate or graduate credit offerings except for a few crisis situations where SEEN has been valuable in temporary inter-campus course sharing.

The greatest area of potential increase in SEEN clientele development seems to lie with technically-oriented offerings designed for engineers or non-engineers in such subjects as Environmental Impact Statements, Products Liability, Citizen Involvement in Public Works Project Planning, Alternate Energy Sources, Etc.

Notations:

1. This case study is based upon the author's portion of a 7-chapter volume published in 1974 for UNESCO's International Working Group in Continuing Education of Engineers by University of Wisconsin-Extension entitled Continuing Education for Engineers -- A University Program. Information included here updates that presented in 1974.

2. The acronym "SEEN" originally stood for Statewide Engineering Extension Network. The current title reflects the expanding use of the network by other departments within the University System.

3. Electrowriter is a trade name for an overhead projector whose writing instrument is electronically slaved to the writing instrument in the hands of the instructor. It was manufactured by Victor Graphics, a division of Victor Comptometer and has been modified to some extent to adapt it to use with SEEN. It is no longer in production.

4. One of 4 budget areas of the Department of Engineering and Applied Science. The other areas are: Evening Courses; Institutes and Short Courses; and Correspondence Study.

5. The word simulcast is used here to describe the broadcast or transmission by wire of a program of instruction simultaneously with its conduct in the originating classroom.

6. The cost does not include overhead items such as charges for office space, utilities, and classrooms.

PROGRAM EVALUATION IN TELECOMMUNICATIONS

Gordon A. Hoke
Center for Instructional Research and Curriculum Evaluation
University of Illinois at Urbana-Champaign

Background

Development of the United States has been traditionally identified with changes in transportation. Early settlements along the Atlantic coast were followed by establishment of outposts at the juncture of rivers. The latter also functioned as gateways to the interior and as a means of conducting trade and communication. Perhaps this era peaked with the construction of several canals in the early 1800s.

The Civil War spotlighted the growing importance of railroads, not only as a means for transporting goods and people but as a tangible and symbolic representation of the need to integrate disparate regions in the cause of technological advances. Historians have noted that the nation could not afford--politically or financially--to have access to southern markets and ports threatened by the creation of an independent Confederacy.

In 1900, the aircraft industry as such did not exist; less than 50 years later, stimulated by the advent of World War II, it was the third largest employer in the country.

Shortly following the close of that war, the Interstate and Defense Highway System was launched. A famed scholar-statesman describes its momentous impact.[1]

> This was a program which the twenty-first century will almost certainly judge to have had more influence on the shape and development of American cities, the distribution of population within metropolitan areas and across the nation as a whole, the location of industry and various kinds of employment opportunities (and, through all these, immense influence on race relations and the welfare of black Americans) than any initiative of the middle third of the twentieth century. This was, of course, the Interstate and Defense Highway System. It has been, it is, the largest public works program in history. Activities such as urban renewal, public housing, community development, and the like are reduced to mere digressions when compared to the extraordinary impact of the highway program.
>
> . . . .
>
> Highways have never been a subject of any very great interest among persons given to writing or speculating about government. Certainly they have rarely been associated with social welfare issues, save in the early days of 'getting the farmer out of the mud.' Further, the politics of getting the Interstate Highway program enacted decreed, or at least indicated, the narrowest possible definition of its purpose and impact. . . . Had anyone realized what they (Bureau of Public Roads) were in fact doing, the sheer magnitude of the interests they were affecting, it is nigh impossible to imagine that they would have won acceptance.

Today, the issues surrounding production and utilization of energy are again underscoring the role of transportation. Technological breakthroughs also have thrust telecommunications into the center of social-political-economic discussions. If the United States is to capitalize on opportunities afforded by the new technology, a trio of important lessons can be drawn from an examination of the brief history outlined above.

1. We have never had an integrated system of transportation. Canals and railroads were both integral parts, if not causes, of "boom and bust" cycles. Also note recent GM televised ads proclaiming their products as "transportation", not automobiles.

2. Attempts to assess the cost-effectiveness of various modes of transportation and other forms of economic development have usually ignored the "social costs" of such enterprises. The current tension between public sector/private sector exchanges will grow as the nation increasingly becomes a service-oriented, knowledge-based society.

3. Qualitative indicators are emerging as a crucial need because of concern about the quality of life. The "social indicators" movement in evaluation is a byproduct of this thrust.

The following pages are an attempt to examine these "lessons" within the framework of instructional design and its ties to the realm of telecommunications.

Purposeful Activity

One definition of instruction describes it as "knowledge or discipline acquired by way of education." The same dictionary views design as representing a "purpose or view, an aim or intention."

Robert Stake has created an evaluation plan which emphasizes the role of intentions or outcomes.[2] Stake writes:

> This paper is not about what should be measured or how to measure. It is background for developing an evaluation plan. What and how are decided later . . . . I presume that the value of a program depends on its program of use. The evaluation of a program includes the evaluation of its materials.

Although my remarks will go beyond the limits implied above, Stake's data matrix (see Figure 1) based on concepts of antecedents, transactions, and outcomes is employed as a way of organizing this section.

Antecedents

Antecedents are "conditions existing prior to teaching and learning which may relate to outcomes," Stake declares. Instructional designers often call them "entry behaviors."

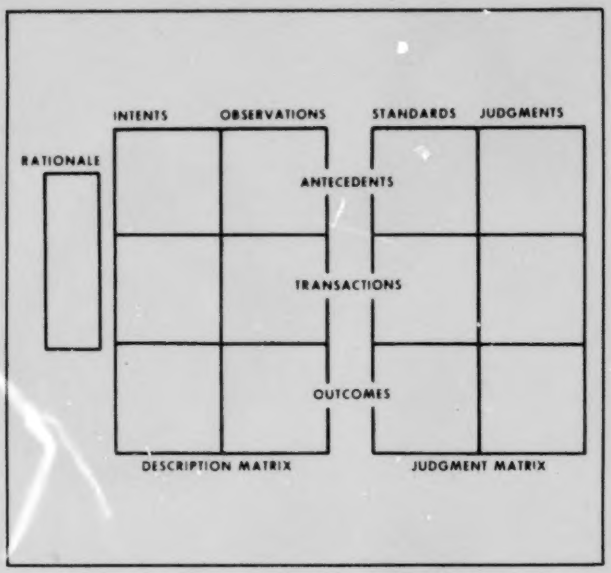

Figure 1. A layout of statements and data to be collected by the evaluator of an educational program.

In recent years, numerous resources have been committed to needs assessments as an avenue for ascertaining the nature of pre-existing conditions or behaviors. The results have been frequently disappointing because of the interdependence of needs. A brief paper prepared by the author[3] cautions that if need is viewed as a gap between an existing condition and a desired state, various components of that gap should be determined. A federal document underscores the tangled web of negative elements facing several rural regions and urban sectors of the United States.[4]

> In no small measure, the regional problems of rural America and of the city centers are associated with the failure of local and regional educational policies and institutions to keep pace with national economic and technological development.
>
> . . . .
>
> Whereas many service functions such as banking, insurance, communication, and travel have been radically affected by the incorporation of modern technology, educational institutions have, for the most part, been slow to incorporate changes in the form of either technological, administrative, or institutional modifications.

If telecommunications is to fulfill its promise of creating a more enlightened public, then the multiple tasks of preparing *both* the learning situation and the individual or group for the advent of technology must be acknowledged. Aggregation of audiences or clients across traditional boundaries of social-political-economic jurisdictions is a serious matter for those persons and agencies interested in promoting telecommunications. Telephone systems linked to computers and satellites are a graphic illustration of political and legal complications. The need to fashion new forms of social infrastructures is also acute.[5]

> The gap between what is scientifically known and what is actually practiced in many communities is often great. This gap is frequently accounted for by such overly simple statements as 'people are that way,' 'that's human nature,' 'there are no leaders in our community,' and 'man is irrational.' Our thinking, on the contrary, is that the spotlight should be refocused from the individual and his irrationality to group processes and social machinery. Rational men working as individuals without social machinery cannot solve some kinds of community problems. Men as they are, with both rational and irational tendencies, can achieve considerable success in problem solving if they have effective social machinery. This lack of social machinery to achieve the high potential inherent in contemporary community life is a basic structural weakness in communities throughout the United States and throughout the world.

Transactions

Our studies conducted in rural sectors over the past six years suggest that the functions of *all* social and political institutions are strongly challenged by the new media and by fewer constraints regarding what can be openly communicated in the name of "entertainment." Yet a fundamental problem confronting rural and urban citizens alike is that of acquiring the range and depth of information and understanding about social and political issues consistent with the complexity of those problems--i.e., on a par with the information and content-analysis normally available to them in their vocational tasks. Because knowledge is the newest resource within potential reach of most people, access to knowledge must have a very high priority in any policy designed to encourage individuals and groups to exercise more control over their own futures. It is no accident that issues centered on control and use of information are becoming such heated points of debate and conflict.

"Transactions are dynamic whereas antecedents and outcomes are relative static," Stake asserts. The former, he continues, are those "countless encounters of students with teachers, student with student, author with reader, parent with counselor--*the succession of engagements which comprise the process of education.*" (italics added)

Open universities have employed a number of settings in efforts to facilitate the activities cited above. Nonetheless, reliance on teleconferencing, for example, reduces face to face transactions viewed by many as crucial to effective communication and learning. The ATS-F Educational Satellite Project was forced to cope with several related incidents precipitated by changes induced through the presence of technological aids. An analysis of two transactions occurring in the Appalachian "footprint" is suggestive of future events.[6]

> The data indicated that instruction involving at least the initial learning activity in the unit prepared the subjects to perform better the behaviors specified for the unit. However, gains in performance were not detected for additional learning activities in the sequence. This may mean that activities subsequent to the televised lecture simply repeat former coverage, rather than prepare the subject to perform higher cognitive behaviors. Since no tests were given after the lapse of a substantial amount of time, however, it is impossible to say whether the additional learning activities in the sequence increased long-term retention of the material.
>
> . . . .
>
> The data also indicated that the subjects preferred situation-centered handling of concepts to abstract discussions about them. The responses during the

> audience-reaction study suggested that the subjects preferred discussions of issues immediately relevant to them as classroom teachers. They seemed to like visuals showing actual classroom situations more than watching the lecturer. Consequently, whenever possible it might be a good idea to explain concepts and procedures through the construction of actual or fabricated situations that demonstrate them.

Stake warns that the boundaries between antecedents, transactions, and outcomes are not clear--i.e., in examining a transaction it is possible to identify certain outcomes which are feedback antecedents for subsequent learning or activities. This process is captured in an account of dynamics surrounding the video telephone.[7]

> Although the video telephones form an insignificant component of present telecommunications, we believe that as their wide-ranging usefulness is more generally perceived, strong demand will arise from unsuspected quarters.
>
> . . . .
>
> An example of the kind of transition that we believe video telephones will cause in our society is illustrated by a discussion of the electrical motor.
>
> > 'Finally, the electrical motor made the location of machines independent of the location of the prime mover. The logic of the production process could now dictate the plant layout, and both power supply and equipment could be arranged in accord with criteria of efficient organization. Wholly new possibilities for applying modern techniques of industrial and business management were opened up.'

A videophone requires a very wide transmission bandwidth in comparison to the audio telephone and the latter, of course, is widely accepted; yet both clearly convey the message that the impacts of technological change are many and varied. They include influence upon the course and development of other technologies, changes in the demand for natural and financial resources, changes in health and safety, responses of institutional and legal systems, alteration of social organization, and changes in the values and conduct of personal life.

Outcomes

The results outlined above lend further credence to Moynihan's analysis of the interstate highway system.[8] An assessment of relationships between intended and observed outcomes is especially critical when new ideas and sophisticated technologies are introduced. Figure 2 in Stake's data matrix responds to this demand. He offers a fitting rationale.

> Of those who know both subject matter and pedagogy, we ask, 'Is there a logical connection between this event and this purpose?' If so, a logical contingency exists between these two Intents The record should show it.
>
> Whenever Intents are evaluated the contingency criterion is one of logic. To test the logic of an educational contingency the evaluators rely on previous experience, perhaps on research experience, with similar observables. No immediate observation of these variables, however, is necessary to test the strength of the contingencies among Intents.

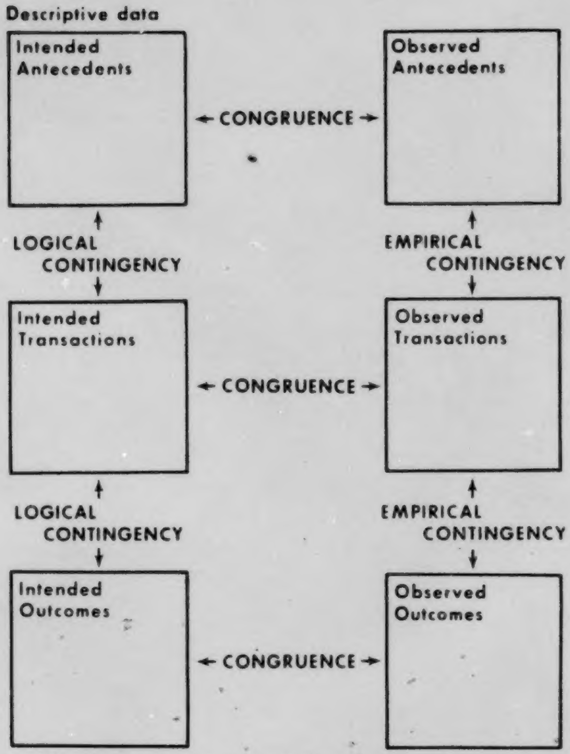

Figure 2. A representation of the processing of descriptive data.

> Evaluation of Observation contingencies depends on empirical evidence. To say, 'this arithmetic class progressed rapidly because the teacher was somewhat but not too sophisticated in mathematics' demands empirical data, either from within the evaluation or from the research literature. The usual evaluation of a single program will not alone provide the data necessary for contingency statements. Here too, then, previous experience with similar observables is a basic qualification of the evaluator.
>
> The contingencies and congruences identified by evaluators are subject to judgment by experts and participants just as more unitary descriptive data are. The importance of non-congruence will vary with different viewpoints. The school superintendent and the school counselor may disagree as to the importance of a cancellation of the scheduled lessons on sex hygiene in the health class. As an example of judging contingencies, the degree to which teacher morale is contingent on the length of the school day may be deemed cause enough to abandon an early morning class by one judge and not another. Perceptions of importance of congruence and contingency deserve the evaluator's careful attention.

The evaluators of programs executed in Appalachia by the ATS-F project urge that formative (process) evaluation should be an integral feature of technological assessment.[9]

> In-process evaluation studies like (these) enable the producers of instructional materials to obtain information they can use to improve their products before they are finalized. In addition, feedback on one unit often helps producers shape other units

more effectively. Although limited time and funding made extensive formative evaluation impossible for the 1974 AESP summer courses, greater involvement of the RCC Evaluation Component in product development should result in the production of better materials.

In our experience, both formative and summative (final or product) evaluation of technology impacts requires sustained monitoring of the programs and of their sites. One-time demonstrations of hardward are helpful but their evaluations are often too limited to be of much aid to planners and policy-makers, particularly those responsible for decisions in the political arena. Systematic selective sampling may be an adequate substitute with respect to identifying opportunities for controlled application of emerging technologies and identifying possible deterimental impacts of these restricted approaches; but meaningful--and credible--evaluations should be conducted over longer periods of time, under realistic conditions. The basic parameters are cited below.[10]

> It now seems clear that any strong causal inference requires longitudinal measurement, or continued 'monitoring' of a system over time.
>
> . . . .
>
> Contextual understanding is as critical to the development of proper adjustments in course as is knowledge of 'current bearings.' The social indicators movement has been most directly concerned with the establishment of current bearings, and less explicitly with contextual understanding.

An appropriate question to address in assessing the consequences of large-scale programs is suggested by a pair of social scientists active in the launching of "Great Society" projects in the 1960s.[11] They state: "The broad-aim program is a major undertaking, and the issue is not the simple-minded one of 'Does it work?' but the much more important one of 'When such a program is introduced, what then happens?'"

Summary

Three years ago we conducted an evaluation of multi-media training package intended for use by volunteer leaders of 4-H clubs, State of Illinois; vinyl sound sheets were part of the package. Our field sites ranged from urban to very small rural counties, and our respondents included junior leaders and some of their most experienced counterparts. An overview of the findings[12] may provide some guideposts for future assessments based on a monitoring of both program and context. We believe the data hold special significance for efforts blending the medium with the message.

1. Respondents were confronted with numerous demands on their time.

> Being a farm wife and mother of five, two presently teen-agers, I know that I don't have the time to be such a leader of youth as the records and materials suggest.
>
> . . . .
>
> This program was offered over a month's period--two nights a week. Your reader response is better if you hold area meetings once a week. These (vinyl sound sheets) are not always expecting the leaders to drive to you.

2. Many respondents were making extensive use of communications technology and they told us that much of the material distributed by Cooperative Extension was outdated: "No one sews like that any more!"

> In executing the case studies, many families interviewed were using two-way radio as a type of telephone linking the house to the fields. Both leaders and members of their clubs were often engaging in more imaginative uses of media than those who are allegedly responsible for 'teaching' them.

3. Innovations require new patterns of behaviors in a new social context.

> There is a growing realization, and it is reflected in interviews conducted with on-campus personnel, that comprehensive use of media requires significant changes in role behaviors of people socialized by more conventional forms of education and experience.

4. Finally, there is an awareness that practices of the past cannot be safely extended into an uncertain future. In our judgment, participants in the study would be receptive to new forms of instruction capable of helping them fashion a more viable, healthier society.

> We needed a little more on the sound sheets on how to work with leaders who have problems inside their clubs. How do we render better 'help' as our number of kids increases while the pool of leaders goes down?
>
> . . . .
>
> We (the advisers) need more training on psychological and sociological problems. On counseling, dealing with people. We need a better understanding of group dynamics, an understanding of individual kids, because leaders are constantly faced with kids they can't control, and they turn to us for advice.
>
> How is the advice to be delivered?

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GROUP PROCESS MODEL FOR PROGRAM PLANNING

Garfield R. Stock
Associate Professor
University of Wisconsin-Extension
Madison, Wisconsin

Introduction

Principles of participative management can be applied to many program situations that involve the Extension professional. They can be utilized by the professional working with committees, planning groups, instructional groups, individuals, and groups of clients. The principles can be taught and demonstrated to volunteers working with adults and youth in Extension programs.

Participative Management Defined

Participative management is a process that jointly involves the person in the leadership role and the individual or group he/she is working with. The process provides for the learner, the client, the child, or individuals in a group to be involved in (a) determining needs,[1] (b) selecting priorities, (c) setting goals, (d) planning, or selecting learning activities, and (e) assessing progress. It is a process whereby the agent, leader or instructor does not impose expert knowledge and opinion on others but rather he/she systematically solicits input from those affected and it becomes a joint decision process.

The client's experience level with the content of the program and in working with others in group situations are factors that influence the degree of participation. Skill in assessing the experience level of participants is a competence the professional needs to have or develop. The process will be effective to the extent that the agent has ability to use it with the clients. Lack of understanding the process can hinder the development of situations in which people are motivated, acquire knowledge, and develop skills.

The level of participation used depending upon the level of experience of the client becomes very important. The agent's ability to judge the level of expertise is a professional skill that must be developed. The process will only be as effective as the agent's ability to use it with the client. The ability to motivate and impart knowledge and skill can be limited by the level of understanding of the process.

Rationale

The effectiveness of programs and activities can be increased in proportion to the participative management (democratic style) skills of the person in the leadership role. Tasks may need to be more structured for the client who has a limited understanding of the task. Identifying and structuring the tasks need to be done within a participative team format. Life Cycle Leadership[2] applied with the quadrant of team leadership of the Managerial Grid[3] may be helpful to the reader in understanding different needs for structuring tasks.

The level of skill and confidence of a person in utilizing the democratic style of leadership is usually related to the individual's belief about the nature of people. It is important to develop a level of confidence and trust in people that they: (1) are willing, (2) have a right, and (3) are capable of being involved in program decisions that affect them. There are two ways to view reasons for using a participative management approach to programming; one is from the standpoint of the leader and the other from the standpoint of the participant. From the standpoint of the leader it encourages (1) programs relevant to client needs and interests, (2) expression of views and opinions on the part of those affected, and (3) social and psychological involvement of participants in program decisions.

It can be tested in programs that require client funding for specific time periods and program area. If the client is willing to pay a fee, they want to be certain it meets their needs and to satisfy the client, a questionnaire or advisory committee approach must be used if we are to carry out the program. With an automatic yearly funds for various programs, we could go for years managing our program in a more autocratic manner (i.e., deciding content because of our training and expertise.)

From the standpoint of the participant it helps: (1) meet the individual's need for belonging, (2) recognizes the individual's integrity and the value of his/her opinion, (3) creates interest, and (4) develops commitment.

Leadership Style

For some of us to utilize a participative management style requires a change in our approach to working with people. First, as an individual, we must decide what we want and need to change. Many of us need to change how we see people and what we believe about people. We need to believe that people are capable and willing to be involved and we can facilitate a climate for involvement.

One of the best explanations of the style of leadership we are describing is the Theory Y approach of Douglas McGregor[4] where he states:

Assumptions:

1. Expenditure of physical and mental effort in work is as natural as play or rest -- depending on controllable conditions work may be either a source of satisfaction or dissatisfaction.
2. External control and the threat of punishment are not the only means for bringing about effort toward objectives. Man will exercise self-direction and self-control in the service of objectives to which he is committed.
3. Commitment is a function of the rewards associated with their achievement.
4. Under proper conditions people will not only accept but seek responsibility--avoidance of responsibility, lack of ambition, emphasis on security are consequences of experience not human characteristics.
5. Capacity to exercise imagination, ingenuity, creativity is widely not narrowly distributed.
6. Intellectual potential of average person are being only partially utilized.

Implications:

1. Central principles derived from Theory Y is integration: the creation of conditions such that members of the group can achieve their own goals best by directing their efforts toward the success of the

program.

2. The programs will be more effective in relation to goals if adjustments are made to the needs and goals of the participants.

Above all, the assumptions of Theory Y point up the fact that the limits on human collaboration in the programming situation are not limits of human nature, but of the leadership's ingenuity in discovering how to realize the potential represented by the human resources. Theory X offers an easy rationalization for ineffective performance: it is the nature of the human resources involved. Theory Y on the other hand places the problem in the lap of the leadership. If participants are indifferent, unwilling to take responsibility or uncooperative, Theory Y implies that the causes lie in the leadership's methods of organization and involvement.

Theory Y assumes that people will exercise self-direction and self-control in the achievement of program objectives to the degree that they are committed to those objectives. Leadership style materially affect this degree of commitment. We need to move to the position of warmth and acceptance rather than one of punishment or rejection. In so doing, the climate for communication and involvement can be enhanced by: (1) being accepting of others and believing that they do the best they can at any time, (2) listening to hear what people are really saying not just the words they use, (3) respecting the dignity of others by treating them with courtesy and feeling that each person is worthy of esteem, and (4) recognizing that everyone brings skills, knowledge and attitudes to the group.

Strategies for Utilizing Participative Management With Groups[5]

When working with a committee or other group of six to ten people the process is quite simple and yet provides the opportunity for each individual to participate on an equal basis. To begin with, have each person list individual concerns, problems, or recommendations on a card of paper in priority order. After the individual lists have been completed have groups of two, three or four get together and from individual lists agree on a list of four or five priority concerns, problems, or recommendations. After the groups have developed their priority lists have them read off and list them on an easel pad or blackboard.

The benefit to the participant of the program is that each and every one is assured of an opportunity for their input to be heard and used. The anonymous collection of all of the individual lists is an important part of the process.

The next step is to have the individuals and groups use the same process to list action program ideas related to the priority problems, concerns, and recommendations identified earlier. At the end of the process volunteers can be recruited to assume various responsibilities for action. This approach with a committee helps reduce the chance of one or two individuals dominating the committee decision process. It provides the opportunity for people that are experienced and inexperienced with the program decision process to participate on an equal basis. For example, when youth get involved for the first time, with adult community leaders on a commission or committee to identify community needs, they are sometimes reluctant to express their views. This process facilitates consideration of the ideas and recommendations of the youth on an equal basis with those of more experienced adults.

When working with a larger group or a diverse audience the process is more complicated but still accomplishes the purpose of individual participation. The process for the meeting would go like this. Have the large group split into small groups of four to ten each and individually list concerns or problems. After enough time has elapsed for each member of the group to complete their list, have each table group make a table list through a round robin approach as explained in Delbecq, et al. After each table has compiled their list in priority order, have all the tables read their lists off round robin style to be recorded on a blackboard or easel pad in front of the room. The next task is for each table to take the total list and convert the concerns into an action program. The action program should include opportunities for the clientele to change their knowledge, skills, and attitudes in order to satisfy their needs. After each table has completed the assignment, list all the action programs on an easel pad round robin fashion. If the list is more than five programs, you may need to have each table again look at the list and set priorities on the action program.

This is the time to ask participants to volunteer to assume responsibility for program implementation.

Program leadership which delegates to committed volunteers responsibilities which they select offers the possibility of vast program expansion.

Summary

Adopting a participatory management approach to working with individuals and groups can improve program effectiveness by: (1) meeting needs of participants, (2) increasing interest and relevance, and (3) developing commitment for assuming responsibilities in programming on the part of participants.

The participatory process as a style of managing your program serves several purposes. (1) The process provides for greater commitment of the client or volunteer leader. (2) It demonstrates through results the benefit of the process and how to work with other people. (3) Contributes to the growth and development of participants.

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A SURVEY OF SMALL BUSINESSMEN'S PERCEPTIONS OF NONTRADITIONAL EDUCATIONAL DELIVERY SYSTEMS: CASE STUDY--UNIVERSITY OF WISCONSIN-EXTENSION, DEPARTMENT OF BUSINESS & MANAGEMENT

Professor Edward M. Pickett
University of Wisconsin-Extension
Madison, Wisconsin

Professor G. M. Naidu
University of Wisconsin-Whitewater
Whitewater, Wisconsin

Background

The Department of Business and Management (DBM) of the University of Wisconsin-Extension was established in 1944. Its purpose is to provide the continuing business and management education and programming entity of the Division of Economic and Environmental Development, University of Wisconsin-Extension. The department serves a clientele of existing and potential professionals, supervisors, and managers from the profit and nonprofit sectors. Its mission is to provide education opportunities in the form of short courses (conferences, seminars, and institutes), special classes, media, and independent study.

One of the three major clientele groups that the department serves is owner/managers of small independent businesses. "County Business Patterns"[1] stated in 1973 there were 78,965 reporting business units in the state of Wisconsin. Of that number, 75,052 (95 percent) employed less than 49 employees. In fact, 36,420 (45 percent) of the total business units employed fewer than three people. Thus, Wisconsin, like many other states, is a state composed of small businesses that lack homogeneity. Diversification of the ten major Standard Industrial Classification (SIC) within the state is illustrated in Chart 1.

The State of Wisconsin runs approximately 340 miles on the north-south axis and 225 miles on the east-west axis and is divided into eight administrative districts (see Chart 2). Most businesses are located in the southern and eastern portions of the state. Thus, there is geographic spread which adds to the lack of homogeneity in a business community. In keeping with the Wisconsin Idea "that the boundaries of the campus are the boundaries of the state," the department faced the responsibility of balancing service to the entire state business community to meet the department goal:

CHART 1

DISTRIBUTION OF BUSINESS BY SIZE, BY SIC

STATE OF WISCONSIN

SIC	NUMBER OF REPORTING UNITS, BY EMPLOYMENT SIZE				
	1 - 3	4 - 7	8 - 19	20 - 49	TOTAL
1. Agriculture, Forestry, and Fishing	369	164	81	12	626
2. Mining	56	53	43	17	169
3. Construction	4,124	1,713	1,169	427	7,433
4. Manufacturing	1,482	1,175	1,738	1,267	5,662
5. Transportation, Communication, Elec., Gas, and Sanitary Services	1,303	649	686	372	3,010
6. Wholesale Trade	2,134	1,328	1,475	713	5,650
7. Retail Trade	11,083	6,613	5,469	2,081	25,246
8. Finance, Insurance, and Real Estate	3,964	1,189	891	409	6,453
9. Service	11,165	4,251	3,027	1,145	19,588
10. Nonclassified	740	262	160	33	1,195
TOTAL	36,420	17,397	14,739	6,476	75,032

CHART 2

DISTRIBUTION OF BUSINESS BY SIZE, BY UNIFORM STATE DISTRICTS

	NUMBER OF REPORTING UNITS, BY EMPLOYMENT SIZE				
DISTRICTS	1 - 3	4 - 7	8 - 19	20 - 49	TOTAL
1. Southern	6,347	3,206	2,612	1,150	13,315
2. Southeastern	12,344	6,072	5,544	2,711	26,671
3. East Central	3,646	1,698	1,416	616	7,376
4. Northeastern	3,651	1,823	1,543	683	7,700
5. Western	1,932	898	730	243	3,803
6. West Central	2,725	1,309	1,038	360	5,432
7. North Central	3,011	1,393	1,064	432	5,900
8. Northwestern	1,549	613	489	175	2,826
TOTAL	35,205	17,012	14,436	6,370	73,023

> To deliver its services on a self-support basis, recognizing economies of scale and variation of education needs of its clientele, the organization they represent, and their geographical location.

Another addition was made to the statement of goals:

> Department programming strives to satisfy specific education needs by the use of specialized media and variation in its delivery systems.

In July, 1975, the chairman, in order to carry out the stated goal, authorized a special study to investigate the use of media as a major delivery system for DBM.

Introduction

The special study started with a situation analysis (see Figure III).

The results of the situation analysis looked promising enough to warrant further study. An analysis was done on the use of faculty time in serving small businesses via nontraditional media. Selected outreach business programs conducted in a traditional manner were compared with an equal number of media courses offered by DBM. Holding quality as a constant between the two methods, it became apparent that nontraditional instruction was serving more businessmen per unit of faculty time input.

One persistent fact kept coming up, and that is how do you reach, in effect, market your product, to 75,000 businesses? The nature of a business clientele is distinct from the clientele of most other extension programming units at the University of Wisconsin. Notably--

- --people can go into business and leave business almost at will. If the business is not incorporated, the only way the state knows about the formation of the business is when a request for a state sales tax number and other required state-assigned numbers is requested.
- --Business is not a profession like medicine, pharmacy, etc.

In order to focus on this situation, the following was formulated: Who is the customer (potential student) and what subject matter does he/she want? Why would he/she be interested in nontraditional instruction? What is the best way to communicate (market) to the small businessman?

Since DBM did not have staff to engage in this marketing research problem, the University of Wisconsin-Whitewater accepted an invitation to submit a proposal to solve this problem.

Agreement Between the University of Wisconsin-Whitewater and the University of Wisconsin-Extension, Department of Business & Management

After a preliminary meeting and the exchange of proposals, it became apparent that a good working arrangement had been reached. DBM would specify its needs and provide its records, and the University of Wisconsin-Whitewater would do the marketing research.

III. SITUATION ANALYSIS

STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
1. Statewide system	1. Techniques and applications of marketing	1. 75,032 small businesses with less than 50 employees	1. Emphasis on $ return
2. Quality technical support	2. Customer not readily identifiable	2. Untapped clients	2. Apathy on part of small business owners unless in a "problem"
3. Management acceptance	3. Limited department experience	3. Declining budgets a) UW b) economy	3. Too long a pay-back period
4. Department reputation	4. Low research on client needs	4. Cost of travel (transportation & living)	4. Inapplicability of subject matter to the media
5. Department support	5. No organizable needs analysis	5. Grants available from industry	5. Update problems
6. Enthusiastic administrator	6. Limited manpower for project	6. Involvement of School of Business and industrial experts	6. Competition for time of potential participants
7. Limited competition	7. No financial support from Extension and State. (Cost of project must be supported by DBM)	7. Development of a continuing clientele by selling on a secondary market	7. Competition for prime time on ETN and SEEN
8. Past successes	8. Weaknesses of ETN, SEEN	8. Research possibilities	
9. Format flexibility	9. Inflexibility of ETN, SEEN schedule	9. Involvement of other units of Extension; ie. Resource Agents	
10. Subject matter competence	10. Lack of financial support for new ventures (R & D) from Extension	10. Multiplier effect	
	11. Extra work load faculty		
	12. Limited number of faculty who have competence in entrepreuneral or venture mgmt.		

Objectives of the Study

These objectives were specified:

1. Identification of the problems, needs, and opportunities in the three-county area of Brown, Dane, and Eau Claire. (See map right)
2. Determination of the awareness and interest of small businessmen with respect to the use and evaluation of nontraditional education delivery systems.
3. Determination of the role of nontraditional education delivery systems in serving the needs of small businesses in the three-county area.

Methodology

A telephone questionnaire was developed and pretested.

A random sample of 247 completed interviews provided the data base for the study covering the SIC codes of contract construction, manufacturing, wholesale trade, retail trade, and services of the population in the three counties.

Extension agents in the three counties were contacted prior to the telephone interviews. All expressed interest in and willingness to cooperate with the study. A letter was sent to the selected businesses by the appropriate extension agent telling the purpose of the study and reassuring them that all information would be held in strict confidence and offering to send a copy of the final study to them.

Cross validation of the sample revealed no significant difference between the sample and the business population with respect to SIC codes. Due to the geographical diversification of the counties sampled, it was hoped that they would be indicative of the whole state.

Developing the Questionnaire

In developing the questionnaire, two considerations were prominant--the high nonresponse rate to mail questionnaires and the time, or lack of it, of the small businessman. An instrument was designed that would be used in conjunction with a telephone interview. Questions were developed to facilitate the telephone interview approach. Pilot testing a 51-question instrument was finalized which would take approximately 12-15 minutes to complete. To meet the specific objectives previously discussed and to provide a profile of the small businessman and the current state of his business, five areas were selected:

1. Business profile
2. Perceived business problem areas/related attitudes
3. Educational resources awareness/opinions of quality/prior use
4. Intentions with regard to use of educational resources
5. Personal background

Data Base

The sample members were selected on a random basis using the State of Wisconsin unemployment tape as the source of information. As previously mentioned, each sample member was sent a letter through his/her UW-Extension agent in advance of the telephone interview. The letter informed the participant about his random selection, the purpose of the study, and asked for cooperation. If the participants were interested, they were told that they would be sent the final report. The letter was designed to facilitate the telephone interview and to increase the response rate.

Control procedures were designed to track the sample telephone numbers by categories. Major categories were completed, refused, recall, not available, and out of business.

The interviewers were members of a marketing fraternity at the University of Wisconsin-Whitewater.

Data collection took three weeks. The completed interviews were coded and key punched for computer analysis.

Curriculum Needs

One stated objective was to determine the problems and education needs of the small businessman. In drawing inferences from the three-county area, variables such as economic base, area, population, and number of small businesses, were taken into consideration by assigning a weight to the appropriate county sample. The respondents were given a choice of three responses: "not a problem," "an occasional problem," or "a constant problem."

If the respondent stated that it was an occasional problem or a constant problem, it was recorded as an educational need. The differences as to perceived needs did not vary significantly among the three counties. High need areas that were identified were:

Credit & Collections	42.1%
Competition	28.7%
Sales Volume	27.9%
Service	27.1%
Training	26.3%
Employee Motivation	24.7%
Forecasting, Planning, & Control	24.3%
Pricing	23.5%
Labor Relations	23.5%
Production Planning & Control	22.3%

It could be argued that some of these areas such as competition are not true education needs. If DBM accepted these as real needs of the owner/manager, it should orient itself to developing these into programs and possibly deleting programs that are in its current inventory.

Respondents' willingness to seek external advice about their business problems: 81.8% of the respondents indicated that they would seek outside advice. Educational institutions were not high on the list of "preferred" sources of advice. They came in fifth place. Ranking above educational institutes were:

1.	Professional consulting groups	58.0%
2.	Financial institutions	55.0%
3.	Business associations	40.9%
4.	Trade associations	40.9%
5.	Educational institutions	35.2%

More than 75 percent of the respondents indicated that additional education would be helpful in operating their businesses, although only 35.6 percent had taken action in that direction. Information about education course work is obtained by the respondents from a variety of sources, such as direct mail--76.9 percent, trade publications--66.4 percent, and magazines--32.6 percent were the three predominant sources.

Awareness of Various Nontraditional Education Programs, Frequency of Use, and Evaluations

The State of Wisconsin has three media services that are considered by the Department of Business & Management to be nontraditional. Educational Telephone Network (ETN), Statewide Extension Education Network (SEEN), and Educational Television Network (ETVN).

Care should be taken in interpreting the following data. It is an overall opinion about the media service, not necessarily with exclusive reference to the delivery service per se and/or instruction.

	Awareness	Use*1	Opinions*2	No Opinion
ETN	15.3%	27.1%	21.8%	63.6%
SEEN	22.6%	20.7%	23.9%	71.6%
ETVN	53.6%	27.7%	37.0%	59.5%

It would appear that the department has a major marketing problem on its hand to raise the level of awareness and use.

Respondents' Preferences for Various Education Delivery Systems

Small businessmen prefer traditional education over nontraditional. The statistics are:

1. Preferred classroom instruction	70.4%
2. Independent study	40.1%
3. Individual consultation	38.1%
4. Video cassette	23.9%
5. ETVN	15.8%
6. ETN/SEEN	13.4%
7. Radio	7.7%

While small, the aggregate of the nontraditional represent a great potential market for the department.

Motivation of Small Business People for Course Enrollment

The respondents were asked to cite three main reasons for enrolling in a course. The results were:

1. To maintain or increase professional competence	88.0%
2. To gain confidence in performing business activities	69.2%
3. For basic career information	51.3%
4. To cope with increased competition	31.0%
5. To overcome fear of business failure	13.3%
6. To increase knowledge in areas of interest unrelated to my present line of business	10.8%
7. To find solutions to declining sales trends	8.2%
8. To reduce climbing inventory costs	7.0%
9. Other reasons	10.1%

Selected Observations on the Awareness of Nontraditional

1. The longer a person has been in business, the more likelihood that that person is aware of ETN/SEEN.
2. The lower the age of the entrepreneur, the lower the awareness of ETN/SEEN. This is also true of education.
3. Those strongly preferring nontraditional media seem to exhibit tendencies for independence and a higher level of confidence in relying on self-decision.

A summary of the seven major findings are:

1. There were subject matter areas such as credit and collection which appeared to be significant problem areas. Other subject matter areas thought to be problem areas did not rank as such.
2. Courses that were industry structured rather than functional structured may be more appealing to specific market segments.
3. Respondents relied on multiple promotion sources for information about business-related course work. Principle sources of information are direct mail, trade publications, and magazines.
4. Only about 15.3 percent of the surveyed population were aware of ETN while 22.6 percent were aware of SEEN and 46.5 percent aware of ETVN. Of those that were aware of the systems, 27 percent used ETN, 20 percent used SEEN, and 27.7 percent used ETVN. Of those who were aware of these media, 22 percent were favorably disposed to ETN, 24 percent had favorable attitudes towards SEEN, and 32 percent expressed favorable attitudes towards ETVN.
5. When taken individually, each of the nontraditional methods of instruction reported out small. Taken as a group, findings represent a substantial market segment whose needs cannot be ignored. Consistent with theories of consumer behavior, the willingness to adopt nontraditional programs seems to be closely associated with the awareness towards such programs.
6. More than 68 percent of the respondents preferred traditional classroom instruction while 58.3 percent preferred individual consultation or instruction, and 29.1 percent preferred nontraditional media. There is a considerable overlap between these three groups. A flexible group which was favorable to the three major forms of instruction comprised 17.4 percent of the sample.
7. The younger, better educated respondents seem to lean more towards nontraditional.

***1. Often and/or occasional by the population that was aware of the system.**

***2. Rated it excellent or good by the population that was aware of the system. Response is not necessarily an indicator of use.**

[1] U.S. Bureau of the Census County Business Patterns: CBP-73-51WI, U.S. Government Printing Office, Washington, DC, 1973

INTRODUCTION TO TELECONFERENCING

Dr. Lorne A. Parker, Director
Marcia A. Baird, Assistant Director
Dennis A. Gilbertson, Technical Director

Instructional Communications Systems
University of Wisconsin-Extension

INTRODUCTION

Today's academic communities are being faced with ever changing issues that usually revolve around enrollment, funding, inflation, and general management of their particular institutions. For example, national statistics tell us that enrollments in higher education are currently stabilizing and are forecasted to slowly decrease in many institutions during the 1980's.

Furthermore, the Carnegie Commission on Higher Education, which was established in 1967 by the Carnegie Foundation for the Advancement of Teaching predicts that the 1990's will be a period of only slow growth for enrollment. Obviously this has become a major concern for higher education administrators because enrollment is the primary basis for funding. It determines government funding for the public institution sector and direct funding to the private sector in the form of tuition.

Inflation and its impact on funding and operating expenses is also a major concern within these academic communities. It has drastically raised their operating costs without correspondingly increasing their incomes. For example, from 1972 to 1974, inflation consumed two-thirds of a 29 per cent increase in the educational funds as appropriated in 46 states and when considering that fact, the forecasted inflation rates will probably continue to outstretch state funding for education.

Problems like these are being countered by many institutions through the creation and implementation of unique problem solving strategies such as competitive recruitment programs, reciprocal cooperative programs that provide for interinstitutional access to libraries, language labs, medical information and computer utilization. However, a new challenge is beginning to emerge.

Current demands on institutions of higher learning call for immediate and well planned alterations in the traditional methods and ideas for extending the facilities of these schools to remote areas.

Among the problems of providing off-campus instruction is the number of hours spent by instructors traveling from the resident campus to off-campus classes. Often an instructor will spend more time on the highway than in the classroom. Thus, coupled with limited numbers of offerings to distant students is also a restraint on implementing educational opportunities to students and adults in their home communities.

The changing needs and lifestyles of society are forcing educational institutions to seek new and flexible means of instruction against a background of budgetary stringencies.

Such searches are leading a number of institutions to discover the educational potential of the telephone. Although this invention is over 100 years old, it remains the basic instrument of the new communications technology and is supported by a highly developed intrastructure worldwide.

In its first century educators practically ignored the telephone as a teaching medium, but this is changing fast. After many small scale experiments in the sixties a second generation of educational telephone networks is now springing up in North America and Europe.

Although the telephone is no longer a startling innovation in communications, it has been only in the past few years that several technological advances have made it one of the more flexible means of instruction in distant learning education. The telephone is a way of helping those unable or unwilling to participate in traditional learning activities by bringing resource people not ordinarily available right into their community.

Teleteaching can be done in various ways and in various combinations including telelectures, teleconferences and telewriting.

Telelectures transmit and amplify for a group of students in one or several locations someone lecturing at another location. Teleconferences include two-way conversations between the instructor and students. Telewriting permits the transmission of written materials as well as voices between two or more geographical points.

Teleteaching can be done with very simple and inexpensive setups, or may take the form of telelecture or teleconferencing networks involving a central broadcast facility connected to a series of amplified telephones at a number of sites where students are located. At the broadcast location there may be broadcast microphones, taping equipment and teaching aide facilities, as well as audiovisual equipment such as slide projectors at the learning locations.

From the limited number of studies connected with the use of the telephone in distant learning, there is evidence that it is an effective means of learning and that students react favorably to the telephone as a teaching medium.

The telephone is currently being used in a number of ways for undergraduate and graduate courses, refresher courses, extension programming and continuing professional education:

- The University of Missouri, Columbia, teleconferencing system offers credit courses in the College of Education and the Medical School. The network is also used for some noncredit programs and for administrative conferences.

- The University of Minnesota, St. Paul, uses the network for Agricultural Extension Service educational programs in such areas as horticulture, home economics, 4-H youth, and agriculture.

- At the University of Maine, Portland-Gorham, the Bureau of Continuing Education for Nursing offers courses to about 1,200 RN's and LPN's each semester.

DEFINITION OF TERMS

Since many terms used in studies to describe telephone teaching are not uniform, here are a few definitions:

Teleconferencing is the generic term covering distant two-way telephone discussion between two or more groups.

Conference calls are the type of teleconferencing in which ordinary telephone lines are linked together by a telephone operator or a connecting device. Participants could be using amplified telephones at each location or a regular telephone.

Telelecture can best be described as a prearranged telephone call from the classroom to a resource person providing students the opportunity to ask questions and to make comments. Responses are amplified through special telephone equipment for the entire classroom. Microphones and speakers may be placed in appropriate locations in the room, making it possible for all participants to more conveniently interact.

A dedicated system is a teleconferencing network in which permanently installed lines are leased from the telephone company 24 hours a day. All listening centers on a dedicated system are permanent and are wired to operate like a giant party line.

Telewriting has become synonymous with Victor Comptometer Company's electrowriter system and more recently the Talos writing systems. Telewriting is a term coined for a system that allows the transmission of drawings and graphic materials from one location to another. The graphic equipment has the ability to transmit and receive electronically written images with the use of electronic writing equipment and receivers. The image transmitted from the sending location is projected on a screen using an overhead projector at the various receiving locations. Telewriting is usually used as a supplement to teleconferencing.

The electronic blackboard system has recently been developed by Bell Telephone Laboratories and will be offered as a standard AT&T product by July 1977. To transmit normal classroom blackboard graphics or drawings, the instructor simply uses standard chalk on a regular 4' x 8' electronically sensitive standard surfaced blackboard. The handwriting motions are electronically converted and transmitted over a standard telephone line to the receiving end which can be across town or across the country. The signals are then reconverted and displayed on a television screen. The two-way interactive audio is transmitted on another telephone line and both systems can be recorded on a standard stereo tape recorder so the audio and graphics material can be played back at different class meetings at various times and locations.

WHAT IS TELECONFERENCING?

Teleconferencing is the means of joining two or more groups in different locations through a telephone system. Voice amplifiers, speakers and microphones allow remote locations to talk with the instructor and each other.

In a teleconference, phone lines transmit a speaker's voice to communities miles away. There, his words are amplified using special telephone equipment and any participant can respond if appropriate. For instance, an instructor located anywhere in the country can give a lecture simultaneously to several groups of students in different places. The instructor's voice is amplified in each classroom, and the students communicate with the teacher and other students through a microphone.

Teleconferencing can accommodate large groups located at a few different places, or small groups, even individuals, at a multitude of locations. Take, for example, a university with campuses scattered throughout the state. Equip the school with a full teleconference system. On Monday morning, administrators at each campus, no matter how far away, can meet with the central campus via teleconference. Midmorning, faculties can hold monthly meetings over the same system. Later in the day a course in fourth semester Greek could be taught from the main campus, where the only Greek professor is located, to two outlying campuses and four community colleges. That evening, an extension course in real estate law could be brought to a number of outlying community "classrooms."

Frequently it is advisable to prepare and disseminate handouts, charts, slides or other graphics to enhance the teaching-learning process.

A typical use of teleconferencing has been to conduct meetings between a number of people who need to discuss matters concerning their work. On rare occasions, these conferences take on major proportions. Nurses at the University of Quebec recently held a successful meeting with 1,754 participants in eight locations across the province.

Teleconferencing systems are used for many different educational and administrative uses including a variety of specialized programs in medicine, art, music and engineering. Existing systems range from a few sites interconnected by a telephone operator, to complex setups with 200 or more locations integrated with slides, real-time graphics, computers and video tapes.

Types of Educational Teleconferencing

There are basically two types of telephone-based educational delivery systems; the conference call system and the dedicated system.

The Conference Call System

Conference calls, normally made on an operator controlled system, simultaneously link together ordinary telephone lines at a number of locations. These calls are scheduled in advance with an operator who dials all the participants and connects them to what is known as a conference bridge. This is simply an electronic device at the telephone company's central office which allows calls to be joined together.

The conference call system has two major benefits over a dedicated system: (1) flexibility of program and location needs,(2) costs--only pay for time used.

Remember, we are still talking about amplified telephone equipment and microphones at each one of the stations on the conference call. Thus, large numbers of people would be able to hear the speaker and talk with others via the microphones.

The Army's Use of Conference Calls for Education

The U.S. Army uses the dial conference capacity of AUTOVON, the Automatic Voice Network, to conduct training from Army schools to reserves throughout the United States. In one such training program, the Army established a dial-up network connecting seven reserve units. In this way, 50 students at different locations participated in a radio teletype procedures course presented from Fort Gordon, Georgia.

Dedicated System

Unlike conference calls, which employ regular telephone service, a dedicated system uses permanently installed facilities leased from the telephone company on a 24-hour-a-day basis. Since the listening centers are permanent, all the points on the system are wired to operate like a "party line."

The University of Wisconsin's Use of a Dedicated System for Education

The University of Wisconsin-Extension has the largest telephone-based instruction system in the country. A brief explanation of this system will serve as an illustration of this type of teleconferencing.

Wisconsin's Educational Telephone Network (ETN) was developed by the University of Wisconsin-Extension in 1965 as a means of expanding educational opportunities at a minimal cost to state residents. ETN is a private four-wire telephone network that takes the form of a huge party line with a number of people on the same line.

The ETN system was initiated to help doctors throughout the state of Wisconsin keep up with medical advances. From the original postgraduate medical update, ETN has expanded not only the number of listening locations, but in the diversification of its programs. Presentations range from the medical courses to pharmacy, English, law, social work, home economics, library science, education, nursing, physics, agriculture and engineering. In addition, 4-H programs, Extension faculty conferences and weekly departmental staff meetings are carried via this system.

Programs are essentially noncredit continuing education for professional adults in the state.

COMMONALITIES OF SUCCESSFUL SYSTEMS

We have explained and described the two modes of teleconferencing, the conference call and dedicated system. Now it seems worthwhile to examine several telephone systems operating today.

Wisconsin
Florida
Los Angeles
Kansas
Illinois
Ohio
Oklahoma
Open University
University of Quebec
U.S. Army

Projects presented here are growing and successful, in part, because of several factors they share. A look at what they have in common may benefit others considering teleconferencing systems.

Institutional Commitment

Although they come in all sizes, each institution described here believes the telephone is an important tool of instruction and supports it accordingly. For more than a decade, for example, the University of Wisconsin-Extension, has supported its Educational Telephone Network (ETN) as a prized and integral part of statewide outreach. It is one of a handful of communications systems used to implement the Wisconsin Idea in education . . . the idea that the boundaries of the campus are the boundaries of the state.

Types of Programs and Teaching Styles

Successful telephone-based instruction programs consist of more than merely placing a microphone in a traditional face-to-face classroom situation and sending the spoken material out over telephone lines. Instructors who have successfully developed telephone-based courses employ a number of teaching strategies designed specifically for this largely interactive audio medium. Such strategies include short 12 to 15 minute learning segments, interviewing people at different locations, reactor panels, local buzz groups, feedback assignments, site-to-site discussions, and relating questions to student occupations.

Meeting Student and Teacher Needs

Teleconferencing as an alternative educational method prospers in areas where it meets very real, pragmatic professional and economic needs. The lawyer who continually needs to keep abreast of changes in the law in order to maintain his license; the doctor whose constant need to continue his education is juxtaposed against his need to stay near the community he serves; the librarian who has 150 miles and a harsh winter climate separating her and the nearest degree granting campus . . . and the instructors who, because of professional commitments and the sheer logistics of limited time and economics, cannot serve a statewide clientele in traditional face-to-face methods.

Technical Flexibility

Teleconferencing systems need to be flexible. Within the limits of individual systems, whether using the conference call mode or dedicated networks, the system must be adaptable to varying numbers of stations. Equipment must be standardized, easy to operate and suitable for different audience sizes at individual locations. Those systems which have achieved a near maximum level of sophistication, without sacrificing flexibility or standardization are the most successful.

TELECONFERENCING TODAY

The following examples of teleconferencing represent current activity in the field.

Wisconsin

The University of Wisconsin-Extension Educational Telephone Network (ETN) is currently the largest, most sophisticated telephone-based educational delivery system in the United States.

It started in 1965 with 18 listening sites around the state. The listeners might hear the lecture quite clearly one minute, then hear nothing but static the next.

While it was up to the telephone company to work out the technical bugs, it was up to the ETN staff headquartered in Madison and the UW-Extension faculty to work out the program details.

The first program was a seminar for physicians, a group that needed classes in order to learn the latest medical knowledge, but couldn't afford the time to travel far from their patients.

This first class was a hit, and ETN was on its way. The next year three new health programs were scheduled, and the decision was made to start programs for other professionals.

Lawyers, for instance, attended ETN noon lectures while they ate their sack lunches. Over the years, they have had one of the highest turnouts of any groups--about 500 per program.

Soon programs were offered for the general public as well as professionals. These programs included law for the layman, a course on venereal disease, a discussion of the effect of TV violence on children, and another on how to be a better homemaker. Most classes are noncredit, although some credit courses are offered each semester.

In recent years, ETN classes have even been offered in photography and music. In Photo Fundamentals, for example, students mailed their class assignments to their instructor who critiqued and returned them.

Music was harder to adapt to the system, since it requires a higher level of sound quality than a lecture. The test came in the spring of 1973 with a forum for piano teachers. Artists from as far away as Texas and New York performed--via the telephone lines--and listeners were surprised at the almost concert hall quality of the sounds. Teachers demanded an encore and the program has been repeated the last three years.

Today, as the Wisconsin ETN celebrates its eleventh anniversary, there are over 100 UW-Extension courses offered each year to more than 30,000 students. A map identifying ETN community locations within each Wisconsin county is on the following page. Each of the 200 individual locations is equipped with Darome Edu-Com speakers and four microphones connected to a standard telephone facility.

SEEN--A new dimension was added to the ETN idea in 1969, when images could be transmitted along with the telephone lecture. In fact, an additional system was designed and called SEEN, or the Statewide Extension Education Network. With SEEN, the images appear on a screen at the listening site at the same time that the lecturer draws them on an electrowriter. SEEN has made it possible for UWEX faculty to teach calculus, for example, because they can now send out instant equations and formulas. So far, 23 cities have the capability to receive SEEN programs. SEEN locations use Darome Edu-Com units for audio transmission and reception and Victor electrowriter units.

Florida's ETN

For several years the College of Pharmacy has been interested in initiating an educational telephone network in Florida. A foreign graduate pharmacist's program presented the opportunity to develop the network.

In 1973 the Florida legislature mandated that foreign professionals residing in Florida be provided one year of continuing education to prepare them to take the Florida state licensing exam for their profession. The law also specified that the continuing education could be provided in their native tongue at the request of at least 15 students.

The University of Florida School of Pharmacy, Gainesville, was chosen as the agency to provide the necessary education for pharmacists. At the time the act was passed, over 600 graduates of foreign pharmacy schools were living in Florida, mostly Spanish speaking Cuban exiles. They requested that the course be offered in Spanish.

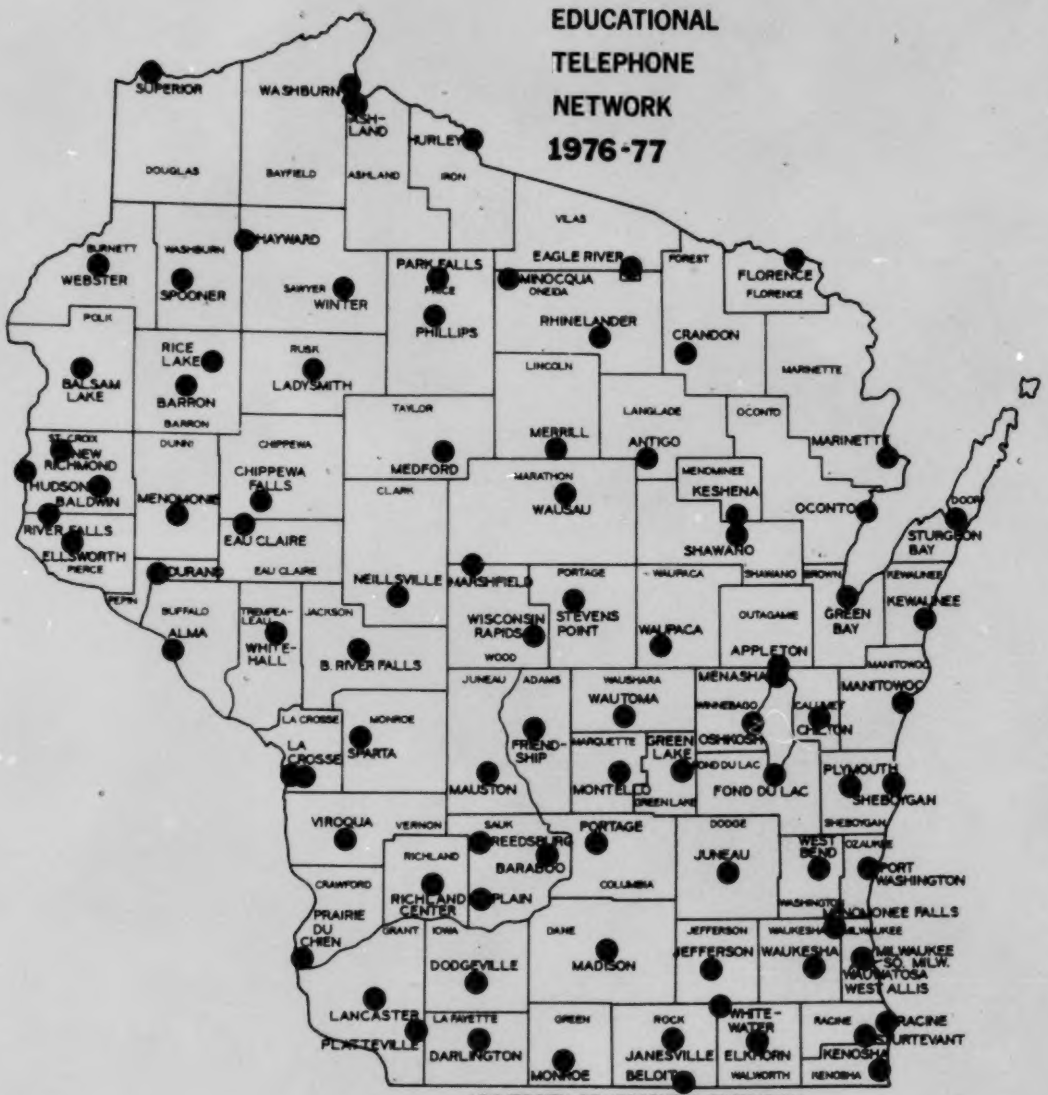
Curriculum development of the proposed courses took place in 1974-75, and methods were established for interfacing an English speaking faculty with a Spanish speaking student group. By the end of 1976 the first one year course was to be completed.

A standard Bell System multi-point dedicated voice grade facility was installed by Southern Bell Telephone Company and Darome Edu-Com station equipment was used because of the multiple stations requirement and the provision for synchronized slide projector capability.

Listening posts were established in Orlando, West Palm Beach, Tampa, Miami, Hollywood and Jacksonville.

Plans are also underway to utilize the network for other mandated continuing education requirements. The College of Education is investigating the potential of ETN for credit courses.

Control of the University Florida system is within the Division of Continuing Education.


EDUCATIONAL
TELEPHONE
NETWORK
1976-77
SUPERIOR
DOUGLAS
WASHBURN
BAYFIELD
ASH-LAND
ASHLAND
HURLEY
IRON
VILAS
BURNETT
WEBSTER
WASHBURN
SPOONER
HAYWARD
SAWYER
WINTER
PARK FALLS
PRICE
PHILLIPS
EAGLE RIVER
MINOCQUA
ONEIDA
RHINELANDER
FOREST
CRANDON
FLORENCE
FLORENCE
MARINETTE
POLK
BALSAM LAKE
RICE LAKE
BARRON
BARRON
RUSK
LADYSMITH
TAYLOR
MEDFORD
LINCOLN
MERRILL
LANGLADE
ANTIGO
OCONTO
MARINETTE
ST. CROIX
NEW RICHMOND
HUDSON
BALDWIN
RIVER FALLS
ELLSWORTH
PIERCE
DUNN
MENOMONIE
CHIPPEWA
CHIPPEWA FALLS
EAU CLAIRE
EAU CLAIRE
CLARK
MARATHON
WAUSAU
MENOMINEE
KESHENA
SHAWANO
OCONTO
DOOR
STURGEON BAY
DURAND
PEPIN
BUFFALO
ALMA
TREMPEA-LEAU
WHITE-HALL
JACKSON
B. RIVER FALLS
NEILLSVILLE
MARSHFIELD
WISCONSIN RAPIDS
WOOD
PORTAGE
STEVENS POINT
WAUPACA
WAUPACA
SHAWANO
BROWN
GREEN BAY
KEWAUNEE
KEWAUNEE
OUTAGAMIE
APPLETON
MENASHA
MANITOWOC
MANITOWOC
LA CROSSE
LA CROSSE
MONROE
SPARTA
JUNEAU
MAUSTON
ADAMS
FRIEND-SHIP
WAUSHARA
WAUTOMA
MARQUETTE
MONTELLO
GREEN LAKE
GREEN LAKE
WINNEBAGO
OSHKOSH
CALUMET
CHILTON
FOND DU LAC
FOND DU LAC
PLYMOUTH
SHEBOYGAN
SHEBOYGAN
VIROQUA
VERNON
SAUK
REEDSBURG
BARABOO
PORTAGE
COLUMBIA
DODGE
JUNEAU
WEST BEND
OZAUKEE
PORT WASHINGTON
RICHLAND
RICHLAND CENTER
PLAIN
CRAWFORD
PRAIRIE DU CHIEN
WASHINGTON
MENOMONEE FALLS
GRANT
IOWA
DODGEVILLE
DANE
MADISON
JEFFERSON
JEFFERSON
WAUKESHA
WAUKESHA
MILWAUKEE
MILWAUKEE
SO. MILW.
WAUWATOSA
WEST ALLIS
LANCASTER
PLATTEVILLE
LA FAYETTE
DARLINGTON
GREEN
MONROE
ROCK
JANESVILLE
BELOIT
WHITE-WATER
ELKHORN
WALWORTH
RACINE
RACINE
STURTEVANT
KENOSHA
KENOSHA

UNIVERSITY OF WISCONSIN-EXTENSION
INSTRUCTIONAL COMMUNICATIONS SYSTEMS

Los Angeles Dial-A-Class

The dial-a-class concept has been around for a long time but with recent developments in technology it has been perfected to an effective educational communications channel. The Belmont Community Adult School, Los Angeles, has been using this system to teach over 500 adult students receiving classroom instruction via the telephone in 25 subjects throughout their district.

The dial-a-class program allows the school district to provide continuing education to anyone who desires to learn. The program started a few years ago to provide students classes of their choice in their homes, in convalescent homes, while in hospitals or any place where they have access to a telephone.

No additional equipment is needed at the listening end unless a headset type receiver or speaker is desired for the system. Teachers contact the classes from a central telephone instructional center. The teacher dials the student's telephone number using a dial card and students are immediately piped into the class. The system has the capability of connecting 18 locations.

At the present time Belmont Community Adult School system students can earn high school credits and take classes on a noncredit basis. Classes offered include United States history, California history, English as a second language, world literature, music masters appreciation, conversational Spanish, mathematics review and conversational English.

Here's how the dial-a-class works:

1. The teacher calls each student to the telephone class with an automatic dialer, quickly and accurately. The teacher may use a speaker phone or operator type headset: both allow hands-free convenience.
2. The student answers the ring of their home telephone, specially provided by the school, and are connected into the teacher's console on a conference hook-up. As a regular classroom, they can chat together while waiting for the rest of the class to arrive on the telephone.
3. After each student is connected, the teacher places his or her card into a special slot on the card dialer console. The student's name is visible and a lamp by each slot flickers when he speaks. The teacher can see at all times who is talking or making noises.
4. As the class proceeds, all students hear the teacher's questions and all hear the answer given by the student called upon.

Features of the dial-a-class are:

1. A teacher can operate the push-button console.
2. A teacher can isolate any student's line to speak with him or her in private.
3. Students can be separated from hearing each other, while the instructor hears and talks with them all.
4. The class can be divided with some students participating in discussion while others work alone on an assignment.
5. Up to nine students can be transferred to another teacher in another location.
6. Recorded teaching materials can be presented over the system.

Kansas

The Regents' Continuing Education Network, installed in 1970, links classrooms in 26 Kansas communities by private four-wire telephone lines. Six Kansas colleges sponsor and develop network credit and noncredit courses. Participating schools include Fort Hays State College, Kansas State College of Pittsburg, Emporia Kansas State College, Kansas State University, Wichita State University and the University of Kansas.

In addition to the above campuses, telephone network classrooms are also located in such places as community junior colleges, vocational-technical schools, grade schools and adult education centers. Each classroom uses a Western Electric 50-A Portable Conference Telephone to participate in the programs.

The Kansas network operates approximately 40 hours each week and involves three types of programs: credit programs, such as Education of Exceptional Children, Problems in Business Administration and Basic Nutrition; noncredit continuing education programs; and in-service training programs contracted by small businesses.

Illinois TeleNet

Illinois TeleNet, Urbana, Illinois, is a 48 station dedicated telephone network of three subsystems which can be used independently or joined together.

One network is a dedicated four-wire system connecting each of eight regional Extension offices, the Extension directors office and two other administrative offices. This network is used for management of state Extension service.

A second network connects all of the offices in Extension region one in the northwest corner of the state and the regional director's office for regional and intercounty communication meetings.

Finally, a 31 station network links other county Extension offices throughout the state for intercounty communication, agent updates and general public programming.

During 1975-76, 640 instructional hours of programming were offered to an estimated 33,869 persons. TeleNet programs have included a tax course, a workshop on how to make visuals, home landscaping, severe weather, legislative updates, interior design and consumer education.

Equipment used for TeleNet is the Western Electric 50-A Portable Conference Telephone. Currently the Western Electric 50A-1, an improved model of the 50-A, and a unit made by Darome, Inc., are being tested on the network. Counties without dedicated TeleNet

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installations can also be connected to a program via a standard telephone facility and a Portable Conference Telephone.

Illinois is exploring the feasibility of every county office having its own TeleNet unit.

Ohio OMEN (Ohio Medical Education Network)

OMEN, Columbus, Ohio, is a two-way audio network linking 95 hospitals in seven states and Canada. It bills itself as the "largest two-way physician's network in North America" and is currently in its 15th year of operation.

Each week the network features discussions between hospital staff physicians and medical school faculty. The discussions link community physicians at hospitals in Ohio, Kentucky, Indiana, Illinois, West Virginia, Pennsylvania, Michigan and Ontario with faculty members at four medical schools: Case Western Reserve University at Cleveland, University of Cincinnati, Medical College of Ohio at Toledo and Ohio State University College of Medicine, Columbus.

During 1975-76, 20,500 people registered in the 125 programs offered. The network is used about 140 hours each year.

To participate in OMEN, each hospital needs two telephones. A regular telephone is used to call in questions and comments to Columbus during the programs. A second telephone receives the program. The receiving line is hooked to network-specified amplifier and loudspeaker equipment at each hospital.

Oklahoma Regional Medical Program

The Oklahoma Regional Medical Program, Oklahoma City, is a dedicated network linking more than 90 hospitals. Among the locations are hospitals in Oklahoma, six in Kansas, and one in Texas. The teleconference network is headquartered within the University of Oklahoma Health Sciences Center.

About 25 courses are offered on a regular basis to supplement hospital in-service education programs. The network is particularly aimed at serving the continuing education needs of doctors and allied health professionals in rural areas.

The Oklahoma program uses standard Bell System dedicated facilities and Darome Edu-Com units for station equipment.

The Open University-London, England

In 1973, this English correspondence institution, which has an enrollment of some 58,000 students, began experimenting with teaching by telephone. While the correspondence unit remains the heart of the Open University, radio, television, face-to-face tutoring and educational counseling at the system's 260 study centers enrich the program. Experiments in teleconferencing have arisen largely because of problems faced by the widely scattered student population and their difficulties in attending the study centers.

In 1975, some 171 students participated in teleconferencing through the Open University. These students formed 25 different groups which studied a variety of courses in math, science, technology and the arts. Individuals were contacted by telephone at their homes and met for about an hour every two weeks. This program was quite successful and experiments are now underway with loudspeaking telephone equipment at the study centers to ascertain the viability of group tutoring and teaching.

University of Quebec

The University of Quebec has used teleconferences as a routine administrative tool for several years. Founded in 1969, the University of Quebec enrolled 30,000 students in 1974-75. Its 20 campuses, centers and research institutes are found in eight cities over an 800 mile area. Thus, the installation of a teleconferencing system helped administrators reduce travel among the various institutions. The University is currently renting about 20 Western Electric Portable Conference Telephone units.

For University of Quebec administrators, the average teleconference involves seven people and lasts about an hour and fifteen minutes. In a two year period, over 25 university committees, involving some 150 people, used this system.

United States Army

In 1975, the United States Army experimented with teleconferencing for in-service reserve training. Using the dial conference capacity of the Army's existing Automatic Voice Network, AUTOVON, a seven-point conference call network was established.

The pilot program linked approximately 50 reserves studying a radio teletype procedures course with instructors from Fort Gordon, Georgia.

Each location was equipped with a Darome two-wire Convener which provided two-way communication between sites, and featured the capacity for remote control of a Kodak carousel.

The Army currently is using teleconferencing to teach medical subjects, officer career courses and helicopter maintenance.

PERSPECTIVE: A BRIEF HISTORY

We have examined educational telephone systems of today, but let us know take a look back to the beginning and see how teleconferencing developed.

Experiments in the use of the telephone for all levels of education, from elementary to graduate, have been going on for nearly three decades. The following brief highlights of where teleconferencing has been will give insight into its future possibilities.

One of the earliest uses of the telephone for education was in 1939, when it was employed to meet the needs of homebound and hospitalized students in Iowa. Within two years, more than 1,000 students were receiving class lectures through intercom equipment in their homes and hospital rooms, at the same time the lessons were being taught to classroom students. All were able to talk with their teachers and fellow students.

Teleconferencing at the college level began in

1947, at the College of Dentistry of the University of Illinois Chicago Medical Campus. Dentists in Scranton, Pennsylvania, took part along with dentists in the Chicago campus classroom.

Of the many pilot amplified telephone programs initiated in the 1950's, the most extensive was that of Stephens College, Columbia, Missouri. Begun in 1958, it was first used for in-service training of science faculty at several colleges. Later, several area colleges and universities employed the system for faculty and facility sharing. Also, through this teleconferencing system, such speakers as Sen. Robert Taft and Harold Stassen were brought to the campus.

In 1960 the University of Omaha began a telelecture program, reaching audiences of up to 500. Later they joined with the University of Colorado in a "Share the Professor" telelecture plan to exchange undergraduate credit classes three times each week.

Wisconsin's Educational Telephone Network (ETN), which has been described earlier, began five years after Omaha's first program.

In 1966, the University of West Virginia started their telelecture program for in-service training to isolated Appalachian school administrators.

Until that year, remote lectures could not be supplemented with the creation of written material as in the classroom. Cornell University's College of Engineering, however, combined telephone and television technologies to teach a course in physical metallurgy to research specialists located 55 miles away in Pennsylvania. The system transmitted both the oral lecture and handwritten materials over telephone lines.

Electrowriters have proven to be an important accessory to teleconferencing. Victor Comptometer Company, Chicago, Illinois, generally is credited with the development and marketing of electrowriters. Wisconsin and West Virginia are just two of the states using this equipment today.

Other telephone networks continued to spring up throughout the Midwest and West during the latter half of the 1960's. Networks in Illinois, Missouri, Kansas, Oregon, Nevada, Wyoming and Minnesota were formed.

The Canadian Department of Indian Affairs also began teleconferencing for administrative purposes in 1972.

LOOKING AHEAD - ELECTRONIC BLACKBOARD

A telewriting feature recently developed by Bell Telephone Laboratories is a system that transmits blackboard writing over ordinary telephone lines for display on a television screen at distant locations.

The electronic blackboard is far less costly than closed circuit television, the only comparable system transmitting both audio and visual information instantaneously. The new device uses ordinary telephone lines and does not require professionally trained technicians to operate.

The University of Illinois,being the trial University, has used the electronic blackboard to successfully conduct remote engineering classes from its campus in Champaign-Urbana to off-campus locations in Freeport, Rock Island, Peoria and Rockford. The system has recently been approved to be introduced into the Bell System as a standard product offering for utilization throughout the United States.

To transmit hardwriting or other graphics, the instructor simply writes on a standard 4' x 8' blackboard which is electronically sensitized such that with normal chalk, remote receivers can view them via standard video monitors on a "real-time" basis.

The interactive audio portion of the lecture is carried over a second telephone line, via a portable conference telephone already offered in many forms by the Bell System.

An interactive teleconferencing system with real-time graphics will increase the capability of remote education and both technical and administrative conferencing. Since the system transmits in real time, classes can be conducted live; however the system is designed to enable an entire lecture including both the interactive audio and graphics to be recorded on a standard stereo tape recorder for subsequent retrieval. For example, if students or conferees are unable to attend the original lecture or conference, they can come to the remote location and replay the tape at their convenience. In this instance, the system replays both the audio and graphics.

THE ECONOMICS OF TELECONFERENCING: AN ILLUSTRATION

Interest in the development of cost per student contact hour of instruction in both face-to-face and media situations has risen to new levels during the past decade. Concern for increased accountability is a dominant theme in a time of economic retrenchment.

The purpose here will be to explore one example of the economics of dedicated facility interactive audio systems, audio graphic systems and video systems as compared to face-to-face instruction.

The base systems cost data used here is from a study conducted by Ted Augustine, former AT&T Marketing Supervisor-Education, on cost comparisons of tying three compuses of Pace University (Manhatten, Westchester, White Plains) and, the Long Island Technical Institute, New York, together via audio-graphic and video systems. Each system will be examined separately.

Base data used in this study includes instructor salary, student contact hours, equipment and facilities.

Instructor Salary

Computations here are based on an annual instructor salary of $18,700. A full teaching load consists of three 3 credit courses each semester.

$18,700 ÷ 6 courses/yr = $3,116.66 salary for one course.

Student Contact Hours (SCH)

SCH = number of students x total course hours.

For example, a 15 week course that meets three hours each week with 20 enrollees = 15 x 3 x 20 = 900 SCH.

Equipment, Facilities, and Personnel

For telephone-based systems, equipment and facilities include control studio for bridging, tape inserts, tape cueing, prerecorded programs, volume control, etc. Also included are program director, classroom studio, terminal equipment and remote classroom with telephone access jacks.

Number of Students

Computations are based on a class size of 20 students for face-to-face instruction. Teleconferencing stations at the four campuses are also assumed here to attract 20 students each or a total of 80 students.

EXAMPLE 1 -- FACE -TO-FACE

Face-to-Face
    -3 credit course to 20 students

Student Contact Hours (SCH)
    -20 students x 3 Hrs/Wk x 15 Wks = 900 SCH

Cost
    -Salary for one 3 credit course = $3,116.66

Cost Per Student Contact Hour
    -$3,116.66 ÷ 900 = $3.46/SCH

EXAMPLE 2 -- AUDIO

Audio to four campuses
    -3 credit course to 80 students

Student Contact Hours (SCH)
    -80 students x 3 Hrs/Wk x 15 Wks = 3600 SCH

Cost
    -System cost of $1,250/Mo
    -$312.50 Wk ÷ 3 Hrs/Wk = $104.17/Hr
    -45 Hr Course x $104.17 = $4,687.49
    -Salary for one 3 credit course = $3,116.66
    -$3,116.66 + $4,687.49 = $7,804.15

Cost Per Student Contact Hour
    -$7,804.15 ÷ 3600 = $2.16/SCH

EXAMPLE 3 - AUDIO GRAPHIC

Audio Graphic to four campuses
    -3 credit course to 80 students

Student Contact Hours (SCH)
    -80 students x 3 Hrs/Wk x 15 Wks = 3600 SCH

Cost
    -System cost of $3,200
    -$800/Wk ÷ 3 Hrs/Wk = $267.00
    -45 Hr Course x $2.67/Hr = $12,015
    -Salary for one 3 credit course = $3,116.66
    -$3,116.66 + $12,015 = $15,131.66

Cost Per Student Contact Hour
    -$15,131.66 ÷ 3600 = $4.20/SCH

EXAMPLE 4 -- VIDEO

Video to four campuses
    -3 credit course to 80 students

Student Contact Hours
    -80 students x 3 Hrs/Wk x 15 Wks = 3600 SCH

Cost
    -System Cost of $24,000/Mo
    -$6000/Wk ÷ 3 Hrs/Wk = $2,000.00
    -45 Hr Course x $2,000/Hr = $90,000
    -Salary for one 3 credit course = $3,116.66
    -$3,166.66 + $90,000 = $93,116.66

Cost Per Student Contact Hour
    -$93,116.66 ÷ 3600 = $25.86/SCH

However, if we begin adding classes onto any of the three technological distribution systems, since our basic costs are fixed, the price per student contact hour decreases quite rapidly.

For example, the hourly cost for an audio system used 3 hours each week is $104.17 an hour, or $2.16 per student contact hour for the example previously cited.

Increase system use to two 3 credit courses each week or 6 hours of system use and the cost per student contact hour decreases significantly. The cost breakdown when offering two courses on the audio system would be:

AUDIO

Audio to four campuses
    -3 credit course to 80 students
    -another 3 credit course to 80 students

Student Contact Hours (SCH)
    -80 students x 3 Hrs/Wk x 15 Wks = 3600 SCH
    -80 students x 3 Hrs/Wk x 15 Wks = 3600 SCH

Cost
    -System cost of $1,250/Mo
    -$312.50/Wk ÷ 6 Hrs/Wk = $52.08/Hr
    -90 Hrs programming x $52.08 = $4,687.49
    -Salary for two 3 credit courses = $6,233.32
    -$6,232.32 + $4,687.49 = $10,920.81

Cost Per Student Contact Hour
    -$10,920.81 ÷ 7200 = $1.51/SCH

RESEARCH SHOWS SUCCESS

Evaluation of telephone-based instruction has been carried out with varying levels of scientific methodology. Some of the studies have compared telephone use with that of other media; others have not. Some were interviews with participants, other involved extensive statistical evaluations.

Following is a brief review of research projects in teleconferencing. It should not be considered a comparative or exhaustive analysis. Overall the studies indicate that telephone-based instruction is as effective as face-to-face instruction.

Nunley[1] (1965) studied the effects of telelecture in retraining two groups of elementary school mathematics teachers. Pre and post tests of achievement, mathematical ability and attitude inventory were given to both the telelecture group and those in the conventional face-to-face situation. There was a significantly greater mean change in content mastery for the telelecture group than for the conventionally taught group. This difference, however, could not be accounted for by variances in ability, teaching attitudes or personal background.

Edelman[2] (1967) studied adult classes in reading and writing Hebrew. Two Hebrew classes were taught simultaneously to telelecture groups in Grand Rapids and East Lansing, Michigan, and to a live control group in Chicago. Each of the experimental groups was originally made up of a minimum of 20 students. A similar control group originally had 40 students. An analysis of scores on a midterm and on an oral reading test indicated no significant differences between performances of the three groups. The presence or absence of the instructor from the classroom did not affect the performance on any of the criteria.

Blackwood and Trent[3] (1968) evaluated 71 students enrolled in a short course on money management. All were members of county Extension Homemakers units in Reno County, Kansas. Pre and post tests were given simultaneously to both groups--the 34 who were taught in the traditional face-to-face method, and the 37 students who were instructed by telephone. Results showed no significant differences in the amount of learning which took place when the educational information was presented to the adult audience through face-to-face or remote teaching techniques and the personal and situational factors; age, level of education, time of day, attitude.

Boswell, et al.,[4] (1968) studied distance teaching involving three classes of an introductory psychology course at the University of Missouri-St. Louis. The 64 member control group received an on-campus lecture. A second group of 63, also on campus, received a live lecture which was simultaneously transmitted to the third group of 22 in a remote classroom. Pre test results indicated no significant differences in content knowledge among the groups and the post test also showed no differences among the groups after training.

Puzzuoli[5] (1970) studied the applicability of teaching university extension classes by telelecture and electrowriter. At West Virginia University, Morgantown, courses in mining, engineering and modern mathematics were given to college classes (control group) and also, using telelecture and electrowriter, to extension classes in a remote location (experimental group). Comparative analysis of the achievement of the two groups showed that achievement by extension classes was equal to, or significantly greater than, that of students in the on-campus classes. Analysis of extension student questionnaire responses supported the thesis that success in telelecture teaching is greater when the professor limits continuous lecturing to 20-25 minutes, provides printed material, uses audiovisual techniques as a supplement, makes a number of personal visits (two or three) to the class and bases the class on problem solving techniques.

From the research connected with the use of the telephone, other studies of interest on many types of subject matter include: graduate courses, Hartje[6]; undergraduate credit, Hoyt and Frye[7], and Zimmerman[8]; teacher education extension courses, Pellett[9]; formalized adult instruction at their place of business with the instructor rotating his appearances among the location, Gold[10]; and art education to small schools in four western states receiving simultaneous instruction from a central source with the aid of overhead transparencies, Jesser and Clarke.[11]

In summary, the studies indicated that the telephone-based instruction compares favorably with face-to-face classes. Consequently, the telephone is a useful educational communications tool capable of being used for effective educational experiences.

TELECONFERENCING HUMANIZING AND TEACHING STRATEGIES

In the century since Alexander Graham Bell put together the first telephone in Branford Ontario Canada, his invention has undergone vast technical development and is now connected to the world's most reliable and sophisticated nationwide network. Although the telephone has been an effective personal communications device, it has been long overlooked as an effective medium for education. The use of the telephone for education has been limited during the past 20 years in favor of more glamourous media. Thus it remains a virtually untapped natural resource for education.

The major thrust here will be to discuss some of the effective humanizing and teaching techniques that are built into the design of telephone-based instruction programs that can be integrated into many teleconference programs.

Program and Administrative Considerations

Let's examine the three most common limitations of teleconferencing.[12]

1. Making A Listening Group A "Group"

When 165 people are dispersed throughout a state at some 10-20 different locations, for example, it's difficult to make the listening group a "group" and not just a collection of strangers. However, the instructor can create a cohesive group feeling and group rapport by:

a. Always calling participants by name and responding to their questions or comments by name.

b. Travelling to teleconference locations to originate programs.

c. Sending out a half sheet of paper on which participants are invited to share information with or ask additional questions of the instructor if program time happens to run out.

These are simply techniques to let participants all around the state know that no matter how many miles separate them, two-way communications channels are always open.

2. Discussion Doesn't Just Happen

Adults like to get actively involved in the learning process. That desire for two-way communication, between participants and instructors and among participants, is the basic benefit of telephone-based instruction as a viable, cost-effective medium. However, no matter how many adults want that opportunity and no matter how easy it is technically, some instructors may have to work at getting teleconference discussions started. There are a few basic reasons why participants may be reluctant to interact at first; they may feel they're infringing on precious program time, other people's time or their question or comment may not be worded correctly. On the other hand, adults frequently are more inclined to ask questions on a telephone system than in a normal classroom situation.

This interactive discussion can easily be initiated by the instructor by:

a. Asking participants to fill out an identification card so the instructor can use this information to help lead adults into discussion and to draw upon their personal experiences.

b. Asking a teleconference group at one site to work together preparing an answer to a specific question for the next week's session thus building in discussion for the next program.

c. Preparing participants for the teleconference learning experience so they're comfortable with it. That preparation may be in the form of a welcome letter before the series begins, explaining the teleconference equipment, how they'll use it and also how the course and its materials will benefit them.

3. People Don't Listen Very Long

It's hard work concentrating on a solitary audio message for very long. For adults, that "very long" is not much more than 12 or 15 minutes.

Because our brains can process information at a greater rate of speed than most people talk, pure sound requires a greater concentration from the learner. If the audio material isn't very challenging to the listener; if it doesn't change pace with a new topic, or a change of voice or an anecdote every 15 minutes or less, then it probably won't hold his or her interest. Minds will start wandering, looking for something more interesting and more challenging. Message retention drops.

There are a variety of techniques to improve remote interactive programming interest in order to stop student mind-drift. Teleconference instructors, for example, have found telephone-based instruction offers them considerable programming flexibility if they consciously address the liveliness of their message. For example, almost anything that catches and holds the positive attention of participants is worth doing. Although some of these techniques have been incorporated in adult education programs for years, there are unique adaptations which have proven especially successful with telephone-based remote education:

a. Substituting a panel discussion with varied voices and ideas in place of a single lecturer.

b. Guest lecturers brought into sparsely populated and remote communities via teleconferencing enable the students to exchange ideas, and ask questions in an across-the-table fashion.

c. Using case studies at each teleconference location for on-site discussion and analysis, followed by enegetic dissection by the entire class.

In summary, the limitations surrounding a non-visual, interactive, remote learning environment can be overcome. There are scores of techniques to humanize the teleconference learning experience, to stimulate statewide discussion and to make the programs lively and interesting.[13]

The questions of "How do I personalize this kind of learning experience for my students?" and "How do I get discussion going?" are among the first concerns expressed by new teleconference programmers and instructors. Although some of these techniques will be described, instructors are only limited by their individual imagination and creativity.

Learning in a remote environment may, at first, seem impersonal to some, but instructors can use several techniques to make the experience highly personal.

Personalizing the Experience for Students

Send Participants A Welcome Letter

Once a participant has registered, instructors should send a "welcome aboard" letter before the first class session. In the letter, the instructor would explain the teleconference system and course objectives. A first assignment can also be made in this letter to get participants involved right away.

Include a Picture of the Instructor/Guest Instructors

Participants are curious about their instructors and each other. Many lecturers have included a picture of themselves and brief bibliography either in the course brochure or in the handout materials for the first program. Occasionally teleconference programs that involve selected sites have asked participants to send a slide of themselves or the group at their site so it can be duplicated and included as part of a program session. In a program devoted to individual or group reporting, the combination of a person's voice with his or her picture can be an effective personalizing experience for all learners.

Distribute a Class Roster to All Participants

Just as participants like to know something about their instructors, they also want to know about each other. One way this can be accomplished is by use of a class roster. On the roster, participants can be separated by location, and included with their names could be a brief description of their educational and/or professional experiences, address and telephone number.

Call on People by Name

Most people like to be recognized by their name. When participants ask questions or make comments, they frequently do so by first identifying themselves and their location. This helps both the instructor and teleconference participants identify a name with a voice. Referring to someone's professional experience, for example, is another way to personalize the teleconference learning environment.

Assign Reports

Participant reporting has many values, as evidenced by its inclusion in the format technique section and the discussion techniques. It is also an excellent way to personalize the teleconference experience for learners as they feel confident drawing upon their own experiences.

Establish Additional Communications Channels

One University of Wisconsin instructor regularly used an "Q and A-O-Gram" technique. This half sheet of paper was an invitation to students to make comments or ask questions that may not have fit into a regular program's question and answer period. Other instructors continually urge participants to write or call them if they have questions after a teleconference.

Visit Teleconference Sites

Many instructors try to visit as many different teleconference locations as they can during a program series. At this time, instructors should try to stay for an hour or two after the teleconference to further get to know their audience.

Schedule Face-to-Face Group Conferences

Instructors can also arrange one day face-to-face conferences in the middle or at the conclusion of their teleconference program series. For ease in student traveling, these conferences can be split among geographical areas, for example, or held in conjunction with other professional conferences. This conference allows participants to meet each other and to take part in a variety of learning activities that may not be able to be accomplished during teleconference sessions.

Let Personality Come Through

Finally in a telephone-based, remote learning environment, it's important for instructors and participants to let their personalities come through the system. Participants can and should hear the emotional attitude in each other's voice and know, for example, whether or not a person is enthusiastic and sincere by the way they come across on the speakers. When people smile, for axample, their voice reflects it. If instructors are sitting alone in an office or studio, for example, they may feel their gestures and expressions are ridiculuous, but they're definitely not. Any animation that makes the message more vital is actually more important in a teleconference program than in the classroom.

Stimulating Statewide Discussion

Stimulating interaction on a telephone-based educational delivery system can be a challenge for instructors. Instead of instant discussion during a question and answer period, instructors may sometimes find themselves greeted with dead silence. To insure teleconference programs are truly interactive, instructors must seek opportunities which encourage participants to actively participate rather than listen passively. Here are a few of the techniques used:

Plant Questions

Planting questions among participants is one technique to get discussion started. Instructors have primed a few enrollees in their programs before a series begins to enter in with questions if discussion lags or is slow to start. Also, moderators try to have several questions handy themselves and feel comfortable asking them.

Assign Feedback

Programmers can create situations to generate questions and discussion. Frequently this is done with handouts that accompany the program. An instructor, for example, may ask two or three teleconference locations to be ready to react during the next program to several specified questions.

Relate Questions to Participant's Occupation

By having the names and occupations of participants in front of them during a program, instructors can design discussion around this information. These facts can easily be obtained from the course registration blank or from participant identification cards completed at the first teleconference program.

If an instructor happens to be talking about apprenticeship, for example, and he knows from his list that there are five to six people in his teleconference class who either work with an apprentice or who are associated with an apprenticeable occupation, then he can direct his question to some of those people. In addition to stimulating discussion, this technique also helps personalize the learning experience.

Initiate Group Projects/Weekly Quizzes

Group projects or weekly quizzes completed by each site can be used to stimulate both on-site and network discussion. Both will permit learners to actively participate in a face-to-face manner and will also keep the program content relevant and practical. Some instructors find a weekly quiz at the beginning of class is an excellent stimulant for discussion on a teleconferencing system.

Group to Group Discussions

Not all questions and comments need to be channeled through the teleconference instructor or moderator. Participants at one location, for example, can talk directly to or question students at one or more other distant locations. Group projects are one way to create situations where participants share discussion among themselves. After hearing or reading a group project report from one location, another group could be assigned the task of evaluating the report on the network or further questioning them. Other sites around the state may join in this discussion and the moderator/instructor can step back and join in the discussion as a fellow participant.

Schedule Oral Assignments

Short reports of five to ten minutes can easily be incorporated in program formats. In addition to stimulating interest among participants, this technique is helpful for triggering comments or reactions.

Teaching Techniques

The two most important elements of a successful program are: (1) content and (2) method of presentation.

Although instructors have incorporated a variety of teaching techniques into their programs for years, these approaches must be adapted to fit the needs of telephone teaching.

These formats include:

Lecture/Question and Answer

The lecture and question and answer format is a popular teleconference format. Doctors, nurses and attorneys, for example, are accustomed to learning this way, and they're a clientele group who like programs in this format. It's also an efficient method. Large numbers of facts, new information or review material can be presented in a short period of time.

Via teleconference systems, however, it's not *just* a lecture. The lecture is reinforced by supplementing oral material with written. Prior to a program, participants are sent skeleton outlines on which they can easily follow and take notes during the lecture. Significant visual materials should also be incorporated into handouts. A list of study questions, bibliographies, additional reading sources, and perhaps brochures, mimeographs, overheads or slides are among other forms of visual material that may be used by teleconference instructors to complement and reinforce their audio presentations.

Sufficient question and answer time is required to insure two-way communication. Teleconference participants need the opportunity to clarify speaker ideas, support or dispute material, or carry the discussion into personally relevant areas.

Celebrity Expertise

Well-known local, national or international authorities are available as teleconference guests. Guests of this caliber not only attract participants to the program, but they also are rich teaching and learning resources and, of course, interest-holders. Guests can easily and inexpensively be connected to teleconference networks via long distance telephone lines. Main presentations may be given live during the actual program, or prerecorded. In the later case, guests can be connected live for the question and answer period. All speakers should be provided with an audience profile. Speakers should also include skeleton outlines or other handout material to reinforce their audio presentation.

Participant Reports

The peer teaching concept is a teaching technique effectively incorporated into teleconference programming. Here students share their experiences as they relate to the subject being discussed with other teleconference students and consequently assume part of the teaching responsibility.

Interview

Interviews of 15 to 20 minutes in length are meaningful segments of teleconference programs. An instructor can either choose a resource person to interview or ask for class participation in the selection process. During the program, the instructor interviews the guest with five to eight questions that participants have sent him. Following that segment, discussion is opened to all remote locations.

Interview formats can also be successful if a particular guest doesn't have time to tailor his or her ideas to meet the needs of a specific audience, or if the guest is not fully aware of audience background or previous teleconference program content. The course moderator/instructor in this case could act as an interviewer, asking the speaker questions to help him or her respond in a relevant manner.

Panel Discussion

If the topic is complex or controversial, panel discussion can create lively, informative teleconference programs. Panelists may be located anywhere in the state or the country. In addition to the topic at hand, the variety of voices helps hold listener attention. Panels should include not more than four members, however, as participants need to be able to distinguish panelists' voices. And, as with any panel discussion, a moderator is essential for keeping the topic in focus. Again, bibliographies and any other appropriate written materials should be sent to the students prior to the program.

Reactor Panels

Program communication, particularly clarification of important points and ideas, can be improved through the use of reactor panels. Members of the panel would be the initial reactors to a teleconference speaker's presentation, guest lecturer, interview or panel discussion, representing the entire audience. To be successful, the speaker, reactor panel members and moderator should agree on program objectives and procedures before the actual program.

When large teleconference enrollments and limited program question and answer time are a problem, reactor panels can be an efficient means of covering common questions that may be on many participant's minds. Once these basic questions are covered by the reactor panel, the network could be opened up for questioning by all participants. This technique is also successful to stimulate discussion.

Role Playing, Skits

Small group skits or playlets can stimulate audience thinking and teleconference discussion. For example, one program for social workers and foster parents frequently uses short vignettes, for example, to realistically portray foster parents feelings. Dramatic talent isn't required. Participants can prerecord skits prior to the actual program or peform them live during the program. On teleconferences, it's best to stick to structured role playing, where the script and performance are carefully planned out prior to the presentation. A suitable introduction and discussion following the skit are needed to insure the intended objective was met.

Buzz Groups

Teleconference participants frequently split into location buzz groups during programs. For example water supply operators from numerous communities used approximately 20 to 30 minutes of their two hour programs for local discussions. After the program's main presentation, groups "broke off" from the network to discuss how their location situation related to the day's topic. This buzz group format gave participants an opportunity to actively participate in the program and also helped keep the program content relevant and practical. A group leader at each location served as a resource person to answer questions, thus alleviating the need to use limited program time for some participant questions. Buzz sessions can also be used to formulate group questions, brainstorm a problem or develop a case study presentation or solution.

Case Study

Students learn by working on real problems. Case study examples are one way to bring discussions down to earth and to stimulate both on-site and network discussion. For example, a group of clergymen enrolled in the program Parish and Personal Conflict: Disaster or Opportunity were encouraged to bring in written case studies of conflict situations in which they were currently or had recently been involved. This data then became the agenda for site group consideration. Spokesmen at each site represented their group and reported on how their group analyzed the problem.

Group Work Sessions

Many programmers structure their sessions to include times of activity as well as listening and discussion. An agricultural engineer who frequently works with 4-H woodworking leaders via teleconference does just that when he presents technical kinds of materials. In a wood identification program, the first half of the program laid the basic background information to the topic; the second half was devoted to actual wood identification by participants at each site.

A wood identification key and many samples of wood had been sent to each site. The program instructor would work with the teleconference group by saying, "Okay, pick up the piece of wood marked number one. Now let's look at it and tie it into the key. Does it have this characteristic, does it have that characteristic?" After working down the key for practice, he'd ask participants to take a second sample and trace it down the key. When participants at a site felt they had it identified, then they'd come on the network and try to get some agreement from others at other sites.

Brainstorming

Brainstorming is a simple concept for getting the most creative energy out of a group discussion. Teleconference committee meetings often follow this format. Here the purpose is to collect a large number of ideas, and brainstorming sessions on the network have ranged from collecting ideas about heritage programs to ideas for a weekend conference for forest owners.

After the program rules are explained, moderators simply open up the network for ideas. The quantity of ideas is more important here than the quality. Free-wheeling should be invited. Editing and synthesis can always be accomplished after the session. Follow-up teleconference sessions can also be scheduled to appraise and further evaluate edited ideas.

Pre-Teleconference Warmup Sessions/ Post-Teleconference Sessions

One method used successfully by several teleconference clientele groups is a warmup session prior to the actual program. By assembling groups at sites an hour before the teleconference, participants can work together on group projects, case studies, discuss outside reading material, and so on in small face-to-face situations. Often these groups find this pre-session to be valuable warmup for getting into the topic. Then, when it's time for the program to begin, they are eager to share their ideas, thoughts and comments with other participants and the instructor.

On-site discussion can also be scheduled for the hour following the session. Participants at each location use this time for such things as group projects, brainstorming, etc.

Summary

Teleconferencing is only a means to an end. Initial psychological barriers to teaching via a telephone-based educational delivery system will probably be more difficult for instructors to overcome than the real ones. However, once these limitations are understood and dealt with, the many capabilities and potentials of telephone-based remote learning will become evident.[14]

Evaluation Process for the University of Wisconsin's Educational Telephone Network (ETN) Programs

In order to determine if the appropriate educational techniques were designed into programs transmitted via Wisconsin's ETN, an evaluation system called the Program Evaluation Checklist (PEC) was developed. Its purpose is to study the relationship between the telephone system of communications and the educational objectives of a program. Specifically, it is concerned with tailoring educational materials for delivery to multiple remote listening stations via a telephone-based system.

The development of this evaluation system required a cooperative effort between content specialists and communication education specialists. This joint effort lead to an agreement concerning a number of variables common to the concerns, interests and objectives of both disciplines.

The PEC consists of a list of statements which defines specific aspects of program content, organization, methods of presentation, materials, lecturer and technical aspects. The participants, representative of an entire ETN class, are asked to evaluate each statement and determine how well it describes the program. For example, in evaluating the program lecturer, one question asks, "The program lecturer/moderator encouraged participants to take an active part in the program." Ratings are made on a numerical scale of 0 to 9. Demographic questions are also included in evaluations to obtain profiles of ETN students.

At the completion of the evaluation process for selected ETN programs, an extensive report is completed and is reviewed with individual instructors. Evaluation materials are strictly confidential between the Instructional Communications Systems staff and the instructor. The paramount purpose of this evaluation process is to determine program strengths and weaknesses and to assist and enhance the selection and utilization of appropriate educational techniques for future ETN programs.[15]

THE TECHNICAL COMPONENTS OF TELECONFERENCING SYSTEMS

A successful teleconferencing system whether made up of two or 200 locations includes three basic components. These are: (1) the terminal or station equipment, (2) the interconnecting transmission system, (3) the network control center. Many variables influence the design of a teleconferencing system. Included are the number of locations; the geographic area covered by the interconnect system; the network configuration, whether the system is a four-wire multi-point dedicated network or a two-wire plain old telephone service (POTS) dial-up network, and the network's intended use, whether designed for corporate committee meetings or statewide outreach education. No two systems will likely be duplicate in design, but several ingredients and operational capabilities are common to successful teleconferencing systems.

Common Technical Ingredients

A teleconferencing system should be able to connect participants at widely scattered regional, statewide or national locations.

The system should provide a communication environment that duplicates [as closely as possible] the single site discussion group.

Terminal or station equipment at locations should provide even sound distribution for up to 200 people and allow easy participation.

The system should be manageable, allowing location and equipment additions and changes to meet user's changing needs.

A network or system control center should be maintained to supervise the network's technical operation and provide a program origination point.

The transmission system should provide clear, intelligible communication between all points on the network.

The system should be able to connect groups anywhere in the world via the regular telephone service.

Methods should be developed to quickly recognize and clear any technical problems interferring with service.

Designs and associated equipment should feature the latest technology and be reliable and serviceable.

All terminal equipment, station location interfaces and installation procedures should be standardized throughout the system.

With these general operational capabilities in mind the three basic components of a teleconferencing system will be described in greater detail.

Terminal or Station Equipment

The following criteria are requirements for successful teleconferencing terminal equipment:

1. The equipment must have four microphones to cover up to 12 people at each location. Microphones must have sufficient cord length for easy reach by participants. Approximately 20 feet of microphone cord can meet varying room and equipment placement conditions.

2. Up-to-date technology must be used in microphone selection. A high quality cardioid microphone will minimize room, acoustical feedback and noise pickup.

3. The speakers must exhibit a high degree of intelligibility to cover up to 200 people at each location.

4. The equipment must produce uniform volume throughout locations, independent of room acoustics. Additional plug-in column speakers should be available for very large or irregularly shaped rooms.

5. A push-to-activate switch should be on each microphone. This switch should be spring loaded so that the microphone is deactivated when the switch is released. This switch does not control the microphone in the classic push-to-talk sense. Experience has shown that participants have difficulty coordinating their hand in a push-to-talk and release-to-listen function. Therefore, voice operated attenuators should be provided in both the receive and transmit signal paths in the station equipment. These voice operated attenuators serve two functions; first, they eliminate potential feedback loops between stations and, second, they allow participants to communicate over the system without the restriction of the classic push-to-talk function.

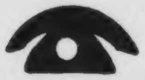
When a participant depresses the push-to-activate bar, this activates his particular microphone but does not cut off the speaker. At this point the system is in a voice activation mode. The voice activation mode allows fast switching of receive and transmit paths and provides maximum interaction over the system.

In contrast, when there are more than 10 locations on a system the presence of 40 microphones all "open" at once causes noise pickup from chair rattling, coughing, paper shuffling and so forth that makes the network unusable. Unfortunately, unlike the human ear, the microphone cannot distinguish between voice and other room noises. In such a system, normal room activity causes the microphone switch to trip. The speaker will cut in and out as the switch operates and information will be lost.

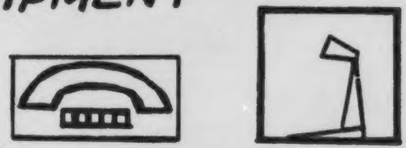
A combination of a push-to-activate switch on each microphone and the voice activated switching mode is a successful compromise for interaction capability

COMPONENTS OF A TELECONFERENCING SYSTEM:

- **STATION EQUIPMENT**



HANDSET
(2 WIRE)



VS. "LOUDSPEAKER TELEPHONES"
(2 OR 4 WIRE)

- **TRANSMISSION SYSTEM**

2 WIRE VS. 4 WIRE

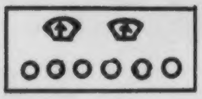
- **CONTROL CENTER**

"OPERATOR-
ASSISTED"
CONFERENCE CALL

1
2
3
4
5
6
7
8
9
0

"DIAL-UP"
CONFERENCE
BRIDGE

"MEET ME"
CONFERENCE
BRIDGE



TECHNICIAN-
CONTROLLED
CONSOLE

on a teleconferencing system. The push-to-activate switch eliminates the accumulated room noise problem and the voice activated directional switch eliminates participants dealing with the classic push-to-talk function.

6. Side tone should be built in the equipment to assist in proper microphone operation. A local public address feature is an example. Its level is set in relation to the incoming program level so participants receive proper side tone level when speaking in a normal voice four to six inches from the microphone. Side tone can be used as a public address feature when the equipment is not used for network programs.

7. The equipment should be designed with standardized interface elements that are uniform with telephone company regulations. The equipment should use the latest technology to provide long term reliability.

8. The terminal equipment should include a local test feature so participants can verify that the equipment is operating properly. A loop back test feature performs this function. Combined with a total system troubleshooting plan, this feature streamlines fault detection and repair. For example, if a location with trouble uses the loop back test feature to verify that the station equipment is operating properly, it eliminates a repairman traveling to the site to check the equipment. The result in time and dollar savings is significant.

9. The terminal equipment should be able to add microphones. An outboarded mixer with microphones that plug into the standard station equipment provides this feature. Mixers can provide additional microphones for locations with large numbers of participants.

The University of Wisconsin uses station equipment designed and manufactured by Darome, Inc., Harvard, Illinois, for its 200 point dedicated network. The equipment has been highly accepted by ETN students and has proved extremely reliable for over three years.

Teleconferencing Transmission Systems

Two general types of teleconferencing transmission systems are in use today. These are a POTS two-wire dial-up network similar to an operator assisted conference call,and a multi-point four-wire dedicated network of leased telephone company facilities. In general a dedicated multi-point conferencing system will utilize the POTS two-wire capability to extend its coverage points to resource people anywhere there is a telephone.

Plain Old Telephone Service (P.O.T.S.) Two-Wire Conferencing System

The two-wire teleconferencing system uses the available public telephone network as a transmission system for its interconnects. Each selected station is dialed individually and connected through a bridging arrangement before the program. Many such conferences are regularly conducted with 10 or less locations using available telephone company conferencing facilities.

A two-wire system must meet three critical requirements to provide successful teleconferences. These are uniform terminal or station equipment, effective bridging for even sound distribution and uniform signal levels at all locations, and efficient controlling functions that allow rapid set-up, location selection and troubleshooting.

A successful two-wire bridging arrangement must also have the capability to connect up to 30 two-wire telephone lines together. The use of up to 30 point two-wire dial-up conferences is a resource just now being developed. Research and development efforts are being conducted in both Bell Telephone Laboratories and in the private sector to provide an efficient and effective multi-point two-wire conferencing capability.

Multi-point Four-Wire Dedicated Teleconferencing System

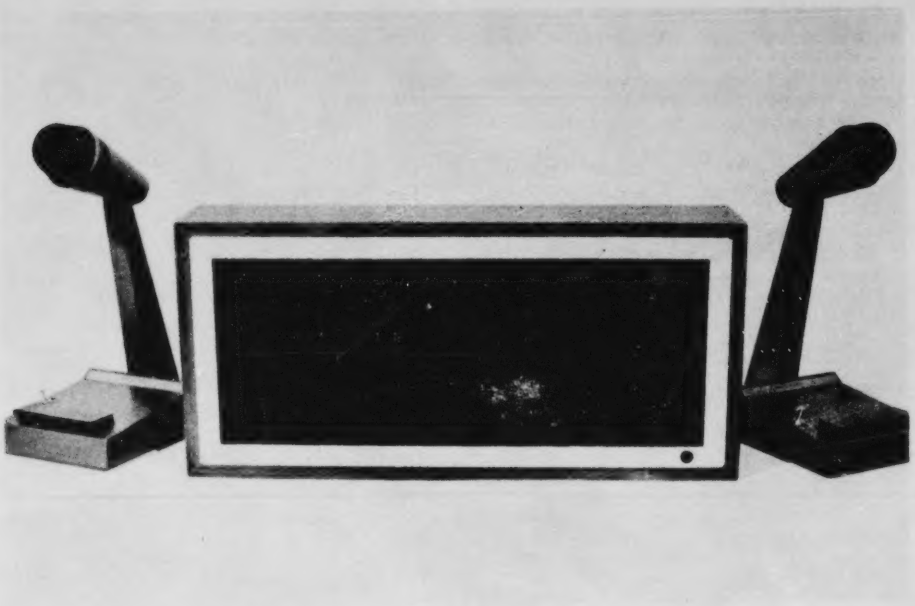
A multi-point private line network utilizes existing telephone facilities to interconnect its many locations. A four-wire system of dedicated lines allows stricter control over transmission system parameters that affect the quality of signals on the system. Fine tuning techniques on such a system results in a transmission quality far exceeding that from a two-wire conference system. The main reasons for this improved transmission quality are stricter control over signal band pass, signal levels and signal to noise ratio. Transmission systems engineers for the Wisconsin Telephone Company have developed criteria for establishing a successful private line multi-point teleconferencing system. For greater detail refer to Braun, Gilbertson and Hansen, 1976.[16]

The basic building block of a four-wire multipoint private line network is a four-wire, six-way bridge. Using this in combination with existing telephone transmission facilities a network of any size can be designed. These bridges can be located regionally; thus a network can be formed in a regional building block fashion. The practical size limit for any region of a multi-point private line telephone network is 20 stations because of noise created by the multiple facilities and circuit terminations.

The University of Wisconsin's 200 station teleconference network operates with satisfactory noise levels because it is a combination of 10 noise-isolated regions. Each region serves approximately 20 stations. The regions are isolated by using voice gated amplifiers at the master combining bridge, located at the central control point. This regional arrangement limits noise experienced at any station to that generated by facilities and terminations within the region.

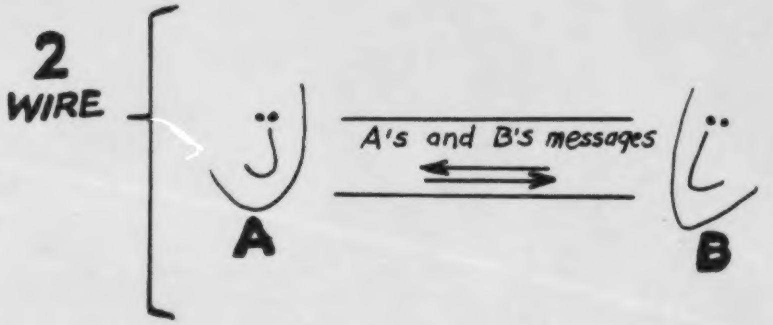
Most of the techniques used to construct a multipoint private line four-wire teleconference system are standard operating procedures within the telephone industry. Equipment is available from several manufacturers and suppliers of standard telephone industry equipment.

An important ingredient in a successful private line telephone network is the ability to connect stations on the public telephone network to the four-wire system. This involves interfacing a two-wire dial-up teleconferencing system with the usually large private line network. The University of Wisconsin system can connect up to six POTS lines to its 200 point network. These lines connect resources who cannot be at network location to the statewide audience.

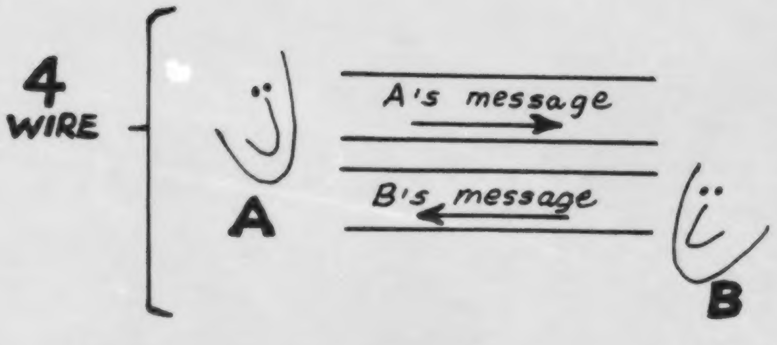


TELECONFERENCING STATION EQUIPMENT

2 WIRE VS. 4 WIRE TRANSMISSION


2 WIRE
A's and B's messages
A
B

- A "BASIC" CIRCUIT CONSISTS OF A PAIR OF WIRES.
- MESSAGES ARE "MIXED"— CHANCE FOR FEEDBACK ON "RETURN LOOP."

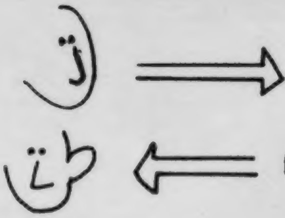

4 WIRE
A's message
B's message
A
B

- EACH MESSAGE CARRIED ON ITS OWN PAIR OF WIRES.
- MESSAGES ARE "ISOLATED" FROM EACH OTHER— NO CHANCE FOR FEEDBACK.

TYPE OF SWITCH - CHARACTERISTICS

MECHANICAL

"CB"

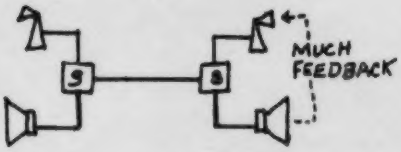


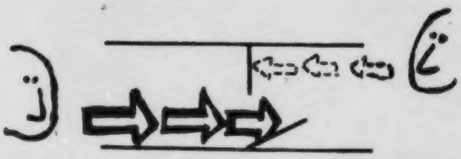
PUSH TO TALK

RELEASE TO LISTEN

VOICE-ACTIVATED HARD SWITCH

"2 WIRE"

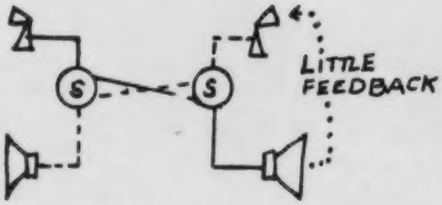

S
S
MUCH FEEDBACK

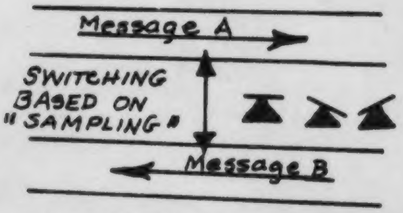


LOUDEST VOICE GETS THROUGH -
"ALL-OR-NOTHING"

VOICE-ACTIVATED SOFT SWITCH

"4 WIRE"


S
S
LITTLE FEEDBACK


Message A
SWITCHING BASED ON "SAMPLING"
Message B

DEPENDING ON WHICH PAIR OF WIRES HAS LOUDEST MESSAGE, OTHER PAIR WILL BE "SOFTENED" BUT NOT COMPLETELY CUT OFF.

Some other keys to the successful development of the University of Wisconsin's private line system include:

1. Limiting amplifiers are used to equalize signal levels between the private line network and the public telephone network (POTS).

2. The network line up levels are optimized for best signal to noise ratio.

3. A master bridge combines the regional networks.

4. The regional control circuits utilize voice gated amplifiers to isolate region noise levels.

5. Standard bridging configurations and equipment minimize design and maintenance practices.

6. All station terminations are standardized, passive and hard-wired using a reliable four-prong jack.

7. Telephone company personnel receive uniform station installation instructions to insure standardized location installations.

8. Uniform testing instructions, one trouble reporting center, and special loop back test features in the portable station equipment facilitate speedy and effective trouble detection and repair.

The exact makeup of any conferencing transmission system depends on many variables, including the available telephone facilities within a particular region. The specific network design should not be constrained by available telephone industry hardware or other standard operating practices. The design and implementation of any system should be sensitive to user requirements, although these requirements are not always met easily. History has shown that highly successful teleconferencing endeavors occur where users and telephone industry personnel work as a team to provide the best service possible.

Teleconference Network Control Center

The control center provides technical supervision and control of the teleconferencing network. It also facilitates network programs.

Any teleconferencing effort more ambitious than an occasional four to five party operator assisted conference call requires an identified control center. This network control center may simply feature standard station equipment with a telephone to report troubles. It may include a tape recorder to record programs. The control center may also be as complex as the one used at the University of Wisconsin where outreach programming runs 16 hours a day, six days a week.

Regardless of the size of the telephone conference control center, four major functions are involved in complete operational control of the system.

Program Control

The control center operator uses a console to control audio sources such as tape recordings and microphones that are used as part of the program. For example, the operator loads any insert tapes on the tape machines and plays them on cue from the instructor. The operator also maintains control over program signals and records the program for future reference. During the program the instructor does not have to cope with the hardware. Using the control center equipment, all technical aspects are handled by the operator.

Telephone Network Control

The telephone conferencing network may be totally dial-up, dedicated, or a combination. The dial-up network uses regular two-wire telephone service connected via a special bridge arrangement. Prior to program time, an operator uses controls that may be similar to a call director and automatic dialer to quickly establish the teleconference network. The network of dedicated lines used in a multipoint private line service, can be arranged as programs and enrollments dictate. Participating locations can be selected for total system programming or regional networks can be established and programmed simultaneously. Dial-up bridging capability can extend coverage of a dedicated network to anywhere in the world via the public telephone service. Complete control of the entire network is maintained in the network control center. The particular control arrangement depends on the design and makeup of the transmission system.

Studio Sound System Control

This provides an important monitoring function for the network control center. Sound distribution is provided to three key areas: in the studios so the instructor can hear the response from the network, in the control room so the operator can monitor all audio channels, and to administrative offices so center staff can listen to programs. General building paging with emergency override to all areas is often included in a large comprehensive network control center.

Network Failure Detection

Effectively detecting and resolving system failures is a key to the success of any teleconferencing network. At the University of Wisconsin system failures occur as few as one or two times a day or up to as many as 10 to 15 times in a 16 hour programming day. Three to five system failures is the daily average. It is important, therefore, that a control center operator isolate and identify these problems quickly. Adequate controls and testing features are consequently integral to the control center. If the network control center operator can isolate problems in the equipment or the telephone services before calling in the trouble to the telephone company, the problem can be solved quicker and easier. Not only can this operator isolate the difficulty, but with experience he can identify the more specific problem, whether its station equipment, transmission line, carrier system, or some other characteristic problem. Given the ability to quickly isolate a region the operator can bypass the problem area and continue to operate the remaining parts of the network. Adequately equipped and manned with trained technical personnel, the control center can minimize network downtime and program interruption caused by system failures.

It is important to recognize that both the customer and the telephone company benefit by providing as many troubleshooting and problem solving controls and features as possible in a network control center. These features help the control center operator minimize the effect of system failures on ongoing programs. A secondary benefit is that this wide range of trouble detection features allows the operator to do most of the troubleshooting--saving the telephone company time and repair costs.

Control center operations at the University of Wisconsin illustrate this process. This network is a good model because it has grown from a few stations to 200. Consider the 10-15 station teleconference networks currently being planned or implemented. As their usage and locations increase, the need for controlling the technical operations will also increase. Eventually, these networks may become as large and their control centers as complex as the one described here.

The University of Wisconsin control complex provides operational control of the 200 point network. Within the complex are studios from which instructors originate their programs and a control room which is manned by a trained technician who handles all equipment and technical adjustments during each program.

The instructor who originates programs at the control center has to cope with minimum technology. During his presentation he need only speak into a microphone controlled by a technician. He hears comments or questions from the network through studio loudspeakers.

The operator uses studio and control room equipment to guarantee a smooth trouble free program. Because he runs all technical aspects of the program, the instructor is free to concentrate on his presentation. The operator's role can be illustrated by describing the steps involved in setting up and operating a typical program.

Before a program, the operator refers to a daily schedule and program format book similar to a radio broadcast continuity sheet which outlines technical operational requirements. He arranges the studio with enough microphones and chairs for participants and sets up a slide projector and screen if needed. Insert tapes are loaded on tape machines and another tape machine is set to record the program.

When the instructor arrives the operator greets him and reviews the program format to check any changes. If a resource is to be connected to the network via telephone, the operator places the call, gets the party on the line, and when ready, connects him to the dedicated network. A program introduction on cartridge tape is played. Studio microphones are switched on and the instructor begins.

During the program the operator plays any tape inserts on cue from the instructor. If a problem develops with the control room equipment, he quickly transfers to a backup unit. If he hears trouble on the network, such as noise, he uses controls to isolate the offending region and reports it to the telephone company test board. All efforts are made to minimize the effect on the program. Thus the operator helps to isolate and correct the problem. Most of the time problems do not occur, however, and the operator continues to monitor the program. This is a simplified view of what occurs in a large teleconferencing network.

The scope and complexity of the control center is dependent upon network size, the clientele being served and programming demands. The large University of Wisconsin network operates as a service agency providing statewide teleconference capability to diversified clientele. The nature and content of the programs being offered by these groups is equally diversified. The program support requirements, system capabilities and control versatility necessary to meet the changing demands of programmers increases the features and complexity of the control center. Characteristically in large systems no one special interest group can support a network the size of the one at the University of Wisconsin. Many beginning networks are motivated to serve single interest groups but are forced to diversify and set up the system as a service agency to spread the operational costs over a large user group.

In the last several years the number of smaller networks has increased. Generally these networks tie two to twenty meeting or conference rooms together in companies, banks and federal agencies. The size of these networks is established initially and locations added usually on a temporary or dial-up basis. These small teleconference or corporate meeting networks may require only a minimal control center. This mini control center would be operated by a user or participant in the meeting rather than a trained technician. However, the same types of functions outlined earlier are required here.

To illustrate this let us describe how these functions relate to a minimal control center.

Program Control

May consist of a cassette machine that can be cued up to present prerecorded programs for inserts. Another cassette machine records the entire program. Copies of this tape can be made and distributed to the participants as meeting notes.

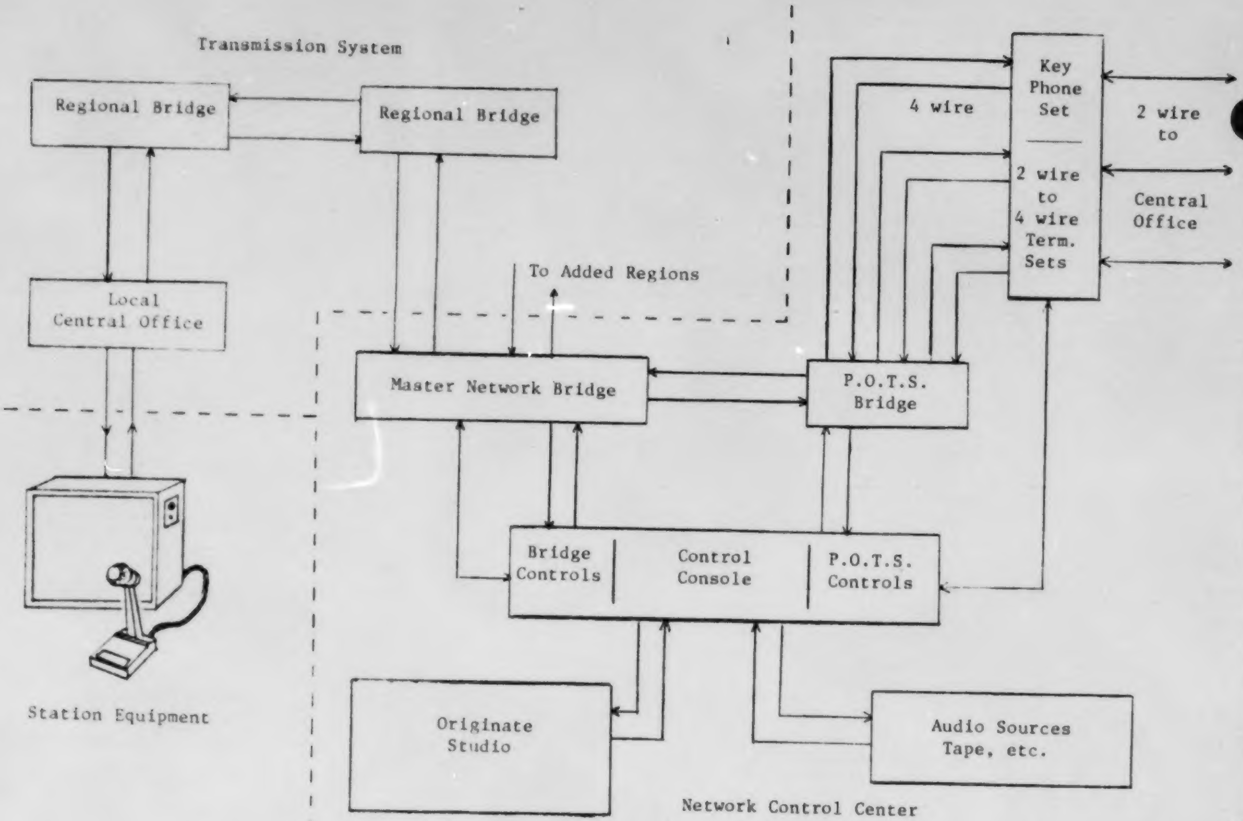
Telephone Network Control

Consists of a telephone with the telephone lines assigned for use on the teleconferencing bridge. The operator can be the user of the network and can simply place the call or calls required to complete the telephone network for the conference. This portion of the control center would resemble a call director. After the calls are completed the operator ties these lines into the conference bridge using appropriate controls on the call director panel.

Network Failure Detection

The control center will have an additional telephone number reserved for trouble calls from participants. This trouble number allows participants to reach the control center operator to describe their problem when they may not be receiving the program or be able to transmit on the network. These simplified control center functions are displayed in a nontechnical manner so that the operator of the teleconferencing system can also be a participant.

There is a tendency for networks that have met with initial success to grow. Sometimes this growth is based strictly on the need for program material. Many technical and operational problems may be tolerated because of these needs. Some midwest networks are large, for example, but are almost unmanageable from a technical standpoint. These networks do not have a control center and are generally operated by the customers without any trained technical support. Consequently, when a problem occurs on these networks, the


Transmission System
Regional Bridge
Regional Bridge
Local Central Office
Station Equipment
To Added Regions
Master Network Bridge
4 wire
Key Phone Set
2 wire to 4 wire Term. Sets
2 wire to Central Office
P.O.T.S. Bridge
Bridge Controls
Control Console
P.O.T.S. Controls
Originate Studio
Audio Sources Tape, etc.
Network Control Center

Components of a Teleconferencing System

NETWORK CONTROL CENTER

telephone company is contacted to isolate it. Generally, this disrupts programs and causes significant downtime of the network. It is costly for both the telephone company and for the customer who normally charges students for the course. Many of these network problems could be resolved with a control center that provides the features described for the Wisconsin system.

A teleconferencing network should start with a control center that will grow with it. Rapid growth and changing demands of network users require a high degree of versatility in the control center equipment. As more features are added, operational complexity increases. These functions are best handled by a trained electronics technician. So along with a well equipped control center, provision should be made for a technical staff qualified to operate and maintain it.

A control center equipped to meet the needs of a large network, such as the one at the University of Wisconsin, must provide more than functional control of the network. It also requires studios and a control room. Much of the equipment is there to augment or improve the instructor's presentations. Certain peripheral support equipment will be required, including tape duplicating and processing equipment, recording studio capability and repair shop support.

The heart of a teleconferencing network control center is the master control console. It is designed to provide a flexible and efficient means for performing the controlling functions of a network. The master control console switches and controls the output amplitude of various audio sources such as tape machines, turntables, studio microphones and telephone network feeds. The ability to mix, distribute, switch and control these audio sources is provided to assign each to its proper destination. Monitoring for program and audition is provided along with testing features and monitoring capabilities. Both four-wire and two-wire bridging modules with associated controls are included to connect regular telephone lines to the teleconferencing network. This master control console also provides audio production and recording capability to the network control center.

In summary, a teleconferencing network benefits greatly by having a control center. Some of these benefits are:

1. The instructor can concentrate on his presentation because he has a minimum of technology to cope with.
2. Maximum use can be made of available telephone circuits.
3. Troubles are recognized, isolated, and repaired quickly, resulting in less network downtime and minimum program interruption.
4. Technical aspects of the teleconference network, effectively controlled and supervised, contribute to the evaluation of a program's success.

ADVANTAGES OF TELECONFERENCING

Research on the use of the telephone in education indicates the telephone is a highly effective delivery technique in communicating educational materials to students throughout a large geographical area. Research also indicates there has been no significant difference between the performance of students with the presence or absence of an instructor from the classroom in teaching via a telephone-based system.

Having examined this and other aspects of telephone-based educational delivery, it seems fair to ask just what are its advantages for students, for instructors, educational planners, or for that matter, educational institutions:

For Students:

1. Teleconferencing provides truly continuing education enabling participants to receive limited amounts of information frequently in their home community. In this way, students can assimilate new information into their daily activities, unlike some of the more traditional forms of continuing education in which students receive massive doses of information once or twice a year.
2. Teleconferencing can meet the needs of students in remote locations. Some professionals have indicated they would not have settled in smaller communities if continuing education via a teleconferencing system had not been available.
3. Comparison studies indicate that students learn as much or more in teleconference situations as in other modes of learning.
4. Teleconferencing allows personalized communication between the student and the instructor and between students at a variety of locations.
5. Through teleconferencing, students can take advantage of quality education at reasonable costs, but are not required to travel great distances or spend large amounts of time away from family or occupational responsibilities.

For Instructors:

1. Teleconferencing allows a sharing of faculty resources. This faculty sharing allows schools to offer more complete educational programs and also allows outstanding teachers to reach students across broad geographical areas. For example, in a specific community college system, one professor taught 12 to 14 students in statics each semester. The other institutions in the system could not afford to offer statics as part of their curriculum. Through teleconferencing, one instructor now offers the course to all 14 campuses in the system. These classes would not normally have been available to students at other campuses.
2. There is great economy in both time and money for faculty. For example, they are not required to travel great distances or spend large amounts of time away from their primary teaching responsibilities.
3. Teleconferencing systems offer flexibility in program planning and scheduling. Systems can accommodate prerecorded tape materials, as well as live lecturers.

4. Teleconferencing systems provide multiple access points which allow instructors flexibility in program origination.

For Educational Administrators:

1. Teleconferencing systems enable institutions to reach entirely new audiences which have previously been neglected. For example, in one state a hospital program was offered to more than 400 housekeepers and 300 food service workers. Prior to this offering, there were few continuing education programs for these personnel. Even if there had been, it is doubtful whether the hospital would have released them from responsibilities and paid their expenses to travel to the courses.
2. Teleconferencing enables an institution to respond quickly and efficiently to the specialized educational needs of groups scattered throughout geographical areas.
3. Teleconferencing enables institutions to offer classes simultaneously to a limited number of remote locations. In other modes of instruction, this offer to few students at a location would not be feasible.
4. Teleconferencing allows institutions to share costs and faculty resources.
5. Teleconferencing systems may be used for administrative purposes when not used for instructional purposes.
6. Teleconferencing systems can be integrated into other types of instructional systems such as multimedia systems, computer assisted instruction and programmed instructional systems.
7. Teleconferencing is frequently less expensive per student contact hour, compared to other instructional media, e.g., remote face-to-face, video, CRI.
8. Teleconferencing has a primary advantage over most other instructional media in that it permits two-way instantaneous interaction between instructor and student and among students.
9. The public relations aspects of teleconferencing are significant. The programs presented via teleconferencing are tangible evidence that an institution is vitally concerned with the day-to-day problems of professionals and consumers, as opposed to the more esoteric research which may eventually filter down to the local level.

For Educational Institutions:

1. Teleconferencing can increase enrollments.
2. Teleconferencing can be responsive to the "needs of society."
3. Teleconferencing can bring quality education to rural areas with sparse population.
4. Teleconferencing can bring quality education to the underprivileged in core cities.
5. Teleconferencing can enhance the image of an institution through committee "branches."

For the most part, the use of the telephone for education has been virtually overlooked for the more glamourous media, e.g., video. The telephone remains virtually an untapped natural resource for education.

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EDUCATIONAL TELECONFERENCING: AN OVERVIEW OF TECHNICAL CONSIDERATIONS

By John S. Daniel, Director of Studies, Télé-université, Quebec, Canada.

1. Introduction

The aim of this brief article is to identify the main technical components of an educational telecommunications system and to highlight the most critical constraints and problems. Each of the issues raised will be explored in more detail by other contributors to this workshop.

2. Communicating over distance: problems of plumbing and wiring

Teaching at a distance means communicating information through channels which link those involved in an educational activity. The technical system which has to be created depends on two factors, the density of information to be communicated and the links one wishes to create. In discussing these factors, we will use two analogies, plumbing in a water system and wiring in an electrical system.

2.1 Rates of transmission of information

A water supply system includes pipes of various sizes. The larger the volume of water to be carried in a given time the bigger the pipe has to be. Telecommunications systems work on the same principle, the greater the information to be communicated per second the larger the channel necessary. The diameter of the water pipe has its equivalent in telecommunication channels in the concept of bandwidth. What are the bandwidths required to communicate information at the rates used in teaching systems?

The most common telecommunications channel is the regular telephone line. This has a bandwidth of between 4-15KHz which, as we might expect, can handle information at the rate of human speech (50,000 bits per sec.). Conveying music with high fidelity involves information transmission at a greater rate and requires a channel at the upper and of this range. In contrast a student working at an interactive teletype terminal connected by telephone line to a computer is sending information at a much lower rate, say 50 bits per sec. Since this is only 'a dribble in the bottom of the pipe' it is possible, by techniques called multiplexing, to use one telephone line to carry data from a number of terminals simultaneously.

The other type of telecommunications channel interest to educators is the television or video channel. Such channels have a bandwidth of 4.5MHz since transmitting television involves information at the rate of 50,000,000 bits per second. Comparing between audio and video channels is like comparing the ½ inch pipe serving the faucets in the house to the 12 inch water main running under the street outside, for these figures mean that the bandwidth requirements increase by a factor of about 1000 on going from data to audio and from audio to video.

Data channel 50 (5×10^1) bits per sec.

Audio channel 50,000 (5×10^4) bits per sec.

Video channel 50,000.000 (5×10^7) bits per sec.

Bandwidth costs money and, like any other commodity, should be used efficiently. Clearly there is no sense in using a video channel where an audio channel would suffice. We shall return later to some of the new technologies which have been developed (slow scan, facsimile transmission, electrographics) so as to transmit visual images using only audio bandwidth.

2.2 What type of communications network?

Electronic communication in the western world is essentially of two kinds. There is the unidirectional one to many link characteristic of TV and radio broadcasting (both 'on air' and cable) and there are the bidirectional one to one links which man's largest machine, the international telephone system, allows us to create at will. Each of these types of communication can be useful in education and the 50,000 student distant study Open University in Britain incorporates both into its teaching system. Some 30 hours of TV programmes and an equivalent amount of radio are broadcast each week on national networks and the telephone is used frequently for discussions between students and local tutorial staff. However as the system developed the need grew for a new type of communication lying between these two extremes and requiring multipoint and multidirectional networks that would allow interaction between people and groups in different places. This is, of course, exactly what the educational telephone network here in Wisconsin makes possible at the level of audio communication. The smaller Statewide Extension Education Network (SEEN) also includes a visual element.

Such situations, which allow communication between many stations, are often known as teleconferences. We shall examine the technical components of simple audio teleconferencing and then discuss the requirements of more sophisticated systems which include the transmission of visual images.

3. Audio teleconferencing: the three components

Any audio teleconferencing system has three main components, the conference bridge, the phone lines linking the bridge to the stations, and the stations themselves. We shall look at each component in turn.

3.1 The conference bridge

A conference bridge is simply a device for joining a group of phone lines together to form a big party line. Indeed, when the Open University first started holding teleconferences in London some years back the lines required were actually soldered to the bridge before each conference. Naturally the sophistication required in a conference bridge depends on the number of lines to be linked. The 'Add-On' device which you can rent on your office telephone for a dollar or so a month is very simple - but then it only allows 3 station conferences. As the number of stations increases it is necessary to provide amplification. An example is the 7 station system installed at the University of Quebec in 1973. It has now been replaced by an electronic 15 station bridge which allows several teleconferences to be held at once provided the total number of stations involved does not exceed 15. Bridges such as those of the University of Quebec, which are designed to link stations anywhere within the international telephone system, have a more critical switching problem than bridges which serve dedicated networks and this explains the move to an electronic bridge on passing from 7 to 15 stations.

Although not strictly a technical consideration we insist here, as we have done elsewhere[1] that any institution intending to hold teleconferences on a regular basis must arrange for the conference bridge to be located within the institution itself.

For large dedicated networks such as the Wisconsin ETN the control console is a complex piece of equipment[2] which includes, besides bridging, the functions of telephone network control and failure detection, the control of the studio sound system and a 2 wire/4 wire interface with the international switched network.

3.2 The phone lines

These days, of course, phone lines not only mean copper wires but also microwave and even satellite links. However, we shall, for simplicity, use the generic term 'lines'.

Clearly the configuration of lines in a teleconference system depends on the stations which have to be linked. Two types of system can be distinguished, the dial-up network and the dedicated network.

3.2.1 Dial-up networks

Some institutions, such as the University of Quebec and the Open University, conduct large numbers of teleconferences in which a number of individuals, each at his home or office phone, are linked together. Each teleconference has a different configuration and is set up using regular public telephone lines. The telephonist dials up each participant in turn and then switches his line into the conference bridge. Both the organizational constraints (i.e. the time taken to place all the calls) and the average line quality in the international switched network means that this procedure is only suitable for teleconferences where less than 20 stations are involved.

3.2.2 Dedicated networks

Where large numbers of stations are involved, as in the 200 station Wisconsin ETN, it is essential to have a fully dedicated network. This means that the lines involved in the network are rented full time from the telephone company. The advantages are firstly that the whole network can be activated by a single switch with no dialling involved and secondly that the lines can be maintained to a high standard of 'cleanliness'. Obviously it slightly limits the flexibility of the system although it is always possible, through the interface mentioned in para 3.1, to link into the dedicated system lines from the international switched network. Another advantage of the dedicated network, which will be explained later, is that a 4 wire system can be used.

3.3 Station equipment

We have already mentioned teleconferences involving individuals using their home phones. In this case the station equipment is a regular handset. However, in teleconferences where a group of people is assembled at each station special equipment is required which allows each person to hear and speak without difficulty. Although one possibility would be to equip each participant with a telephonist's headset most systems opt for some sort of loudspeaking telephone. Braun et al.[2] give an excellent description of the successive - and successful - attempts to obtain suitable equipment for the Wisconsin ETN.

3.3.1 Loudspeaking telephones

Loudspeaking telephones face two problems, feedback and noise. Feedback occurs when the sound coming out of the speaker goes back into the microphone and gives rise to the howl heard occasionally in badly adjusted public address systems. This problem does not occur with an ordinary hand set because the volume is low and the speaker and microphone are separated from each other by a dull (acoustically) human head. However once the sound is amplified so that everyone in the room can hear there is a danger of it being picked up by any open microphone.

Apart from the noise coming from the speaker any group of people in a room generates a certain amount of noise (rustling of paper, coughing, etc). Although the level of this background noise is low at each station, the aggregate noise from a large number of stations would effectively drown out any other sound.

For these two reasons it is essential to control sound coming from each station. One way would simply be to put a manual switch on each microphone but this proves to be rather fastidious for participants and discourages them from talking. The problem is usually resolved by a voice switch which automatically opens the line at a certain level of noise. Clarke and Gale[3], in an excellent article on the problems of loudspeaking telephony, illustrate this switch as a decibel devil who opens the line to the louder speaker.

Examples of equipment with such a switch are the Western Electric '50A' set and the Northern Telecom 'Companion'. These sets are designed to work with the international switched network which is a 2 wire system.

The Wisconsin ETN uses a dedicated 4 wire system. The extra wires mean that, since there are separate channels for sending and receiving the voice switch can open the 'send' channel without blocking the 'receive' channel. This gives a more natural feeling by allowing two people to speak at once but does not obviate the need for the switch itself. In fact,in a large system such as ETN even the voice switch is not enough. With 200 stations the aggregate of loud noises (dropping books, tapping pipes) system wide is enough to keep the voice switches busy and allow too much extraneous noise to circulate. This is why the Darome set used in Wisconsin has a 'press to activate' bar on each mike. Unless the bar is depressed the voice switch cannot operate, but when depressed then speech will trigger the switch. The system is much more relaxing to use than a 'press to talk' system since there is no harm in keeping the bar depressed throughout a discussion in which the station is participating.

4. Adding a visual component

On the principle that educators should appeal to as many senses as possible it would obviously be nice to add a visual component to the audio system described. The simplest method, which 'only' requires good organization is to provide the groups at the stations with visual materials (printed texts and diagrams, slides, microfiches, etc.) and refer to them.

However, unpredictable things happen during lessons and the instructor may require to communicate visual information he did not expect to need. What are the possibilities?

4.1 Visuals with audio bandwidth

If the instructor wishes to communicate visual information and continue talking at the same time he needs to add another communication channel. However, even by adding only another audio channel (phone line) he has several new possibilities: facsimile transmission, electrographics and slow scan TV.

4.1.1 Facsimile transmission

One page of typewritten text contains about 12,000 bits of information. Since we noted in para 2.1 that an audio channel can transmit 50,000 bits per sec. this means that we should be able to transmit an 8 page text in less than 2 seconds. Unfortunately the technology has not got there yet. Regular slow telecopiers take several minutes to transmit a page of information and reproduce it as hard copy at the other end and even so-called rapid facsimile transmitters, which still cost over $10,000, cannot yet be said to transmit text in seconds. However, slow or fast systems could be useful for distributing notes at a distance before the lecture.

4.1.2 Electrographics

Several types of equipment allow you to draw and have the drawing appear live at other stations. Most venerable is the electromechanical Victor Electrowriter and modern versions are the electromagnetic telenote system and the electronic blackboard. This technology is now sufficiently reliable and inexpensive to be worth exploring by any network which considers a graphics capability important.

4.1.3 Slow-scan

To return to our analogy with plumbing, slow-scan can be compared to a lavatory cistern. It fills up gradually but delivers the water rapidly. In slow-scan (controlled-scan) TV the image is sent down the phone line at audio information rates, stored at the other end until it has all got there, and then released on to the screen.

Essentially a way of transmitting still pictures this technology is more in the 'holds promise' than the 'here and now' category. Equipment costs in the $20,000 dollar range and has been used to date largely in point-to-point (rather than multipoint) applications. Without wishing to deny is usefulness for telemedecine we feel that slow scan is not yet ready for education.

4.2 Visuals with video bandwidth

It is easy to imagine an audio system such as described in section 3 supplemented by a video image of the instructor (and blackboard, etc.) broadcast or distributed by cable. Such systems exist e.g. at Stanford University. They work well but are expensive, since bandwidth is an expensive commodity if the area to be covered is large. Satellites may help to bridge distance, and glass fibres may reduce the scarcity of bandwidth radically, but right now video is expensive although, if used in a unidirectional manner, technically straightforward.

Bidirectional video is the subject of many experiments both on satellites and with terrestrial links. However there have been far fewer experiments with multipoint video. There is no real possibility at the present time of constructing a 200 station educational video network so that each station could see and be seen by the 199 others.

In one of the CTS satellite experiments the Canadian government is testing a fully interactive five point system and it will be interesting to see the results. In this project a selective scanning technique is used so as to squeeze 4 video signals down one channel.

5. Conclusions

It is only in the last five years that equipment and expertise have developed sufficiently to make possible reliable educational telephone networks with the high quality sound which favours fluid discussion between stations. That too few people are aware of these developments perhaps explains why many still suppose that interactive distance education must await developments in wide (video) band technology.

We have shown that some methods already exist for transmitting visuals with narrow (audio) band channels and implied that the technology for a cost-effective interactive educational system covering a wide area is already here.

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CONTROLLED-SCAN TELEVIDEO: EFFICIENT UTILIZATION OF COMMUNICATIONS CHANNELS FOR TELECONFERENCING AND DATA ACCESS*

Stuart L. Meyer
Northwestern University

Abstract

Audio-visual material is discussed in a generalized way which shows how transmission in real-, or quasi-real, time can be effected over a variety of channels, both broad-band, in cost-effective "sharing" modes, and narrow-band, such as telephone lines. This has special importance where the visual component does not involve motion (televideo rather than television).

Various conferencing functions may be seen to require only still-picture capability. It is shown that CSTV techniques are both sufficient and cost-effective for analogous teleconferencing applications including many educational situations. Reference is made to Northwestern University demonstrations of the sufficiency of CSTV techniques using only telephone lines in medical training, teleconferencing and off-campus continuing education courses as well as to other experiments elsewhere. Certain improvements, some perhaps crucial, are discussed.

In addition to the obvious cost-effectiveness of CSTV, certain advantages exist even vis-a-vis interactive CCTV when available. There is special application to the problem of sharing the resources of educational institutions including making data bases such as library materials accessible to students and scholars geographically remote from the source.

I. Information, Media and Their Manipulation

We may rely on a very intuitive view of information which tends to distinguish information into visual and aural categories. The former may be text (alphanumeric characters), graphics, mathematics, or pictures, including representations of three-dimensional objects. The latter includes voice communication, especially interactive speech, sounds and music. There is also the "audio-visual" combination. A variety of old and new technologies can *provide information*: books, correspondence courses, programmed texts, audio-cassette lectures, audio-cassette-with-slide lectures, sound motion pictures, *broadcast* radio and TV lectures, video tape presentations and, on the near horizon, videodiscs etc.

The leavening of a human being may be added to any of these in an INTERACTIVE RELATIONSHIP between the participants. The advent of computer-assisted instruction has filled a gap in the spectrum between a "canned" presentation of information and a traditional teaching situation but we must stress the element of INTERACTION as the important point. It is interaction between the student and the presentation of the information which transforms the *transfer of information* into the *process of instruction*.

The popular use of the term "media" encompasses both passive systems and interactive ones and some distinctions should be drawn between them. *Informational* or *recording media* represent ways to store and present information to the student. *Telecommunications media* or *telemedia* involve transmission from one place to another and, for most of our discussion, we shall assume that the transmission is essentially instantaneous. Where we choose to relax this assumption, we shall distinguish between real-time and quasi-real time, the latter being transmission sufficiently soon after an expressed request for information that its receipt is timely and useful. Thus, for the purposes of our discussion, a telecommunications medium is a real-, or quasi-real-, time system which is basically *interactive* and it is the interactive feature which dominates and defines the distinction. Thus, a lecture *broadcast* to a mass audience which cannot immediately respond to or affect the course of the lecture might just as well be recorded and distributed, for the purposes of our distinction. The use of videotape in almost destroying the old distinction between "live" and "recorded" broadcast television is a case in point. To the passive watcher, it makes no difference. To carry our categorization a bit further, it clearly is the case that a teacher and a student on opposite ends of the same log is a completely interactive situation (always assuming the teacher has not cowed or "snowed" the student into passivity). A quasi-interactive situation is one in which the student or scholar has control over part of the presentation but cannot have it modified totally to fit his individual requirements. An example is the ability to select, delete, skip or conjoin materials such as might be the case with accessing of library resource-type materials. We can draw a parallel between real-time/interactive systems and quasi-real-time/quasi-interactive systems and we shall return later to the consideration of overnight "*narrow*-casting" of library materials to individual users. The distinction is not absolute, however, as exemplified by such techniques as computerized-teleconferencing whereby messages are transmitted in alpha-numeric form by teletype terminals and monitored by a supervisory computer. This is basically asynchronous with a participant's return to his terminal being real-time until he replies to all past messages and poses all the questions he has for others.

The nature of information and its manipulation becomes especially important when it must be transmitted over a channel whose capacity is limited. It is important for cost-effectiveness always to keep in mind that channel capacity is a resource which cannot be wasted without incurring economic expense. It has long been recognized that the world is facing a shortage of bandwidth in the frequency spectrum (which Marcel Thue, Chairman of the French Frequency Committee, has called a commodity "that should be treated as a permanent, but limited, natural resource like water"). New technology to provide additional channel capacity is no panacea. New methods or modes achieve cost-effectiveness benefits over prior modes only in certain regimes. Communications satellites, perhaps the most glamorous of the newer modes, become cost-effective vis-a-vis other modes for providing channel capacity only when the distances involved are in excess of 200 miles or where the terrain or access is especially difficult. Efficient use of any channel requires that redundancy of information be eliminated wherever possible. Looking at a stationary object for ten seconds over a full-TV link involves sending 300 identical frames of visual information. If it is possible to send only one frame in a form which is usable at the other end, 300 users could utilize the same channel in this way over the 10-second interval. Motion-television utilizes 30 frames per second to display motion but, on average, 95% of the information in one frame is redundant with that in the frames next to it. On a statistical basis, only about 5% of the information contained in a TV frame needs to be transmitted to depict even motion provided that the information contained in the preceding frame is available to be updated.

The TIME X BANDWIDTH product measures the information which must be sent over a channel. This may be represented graphically as the area on a plot of TIME (that a channel is utilized) versus BANDWIDTH (the frequencies utilized). (See Figure 1)

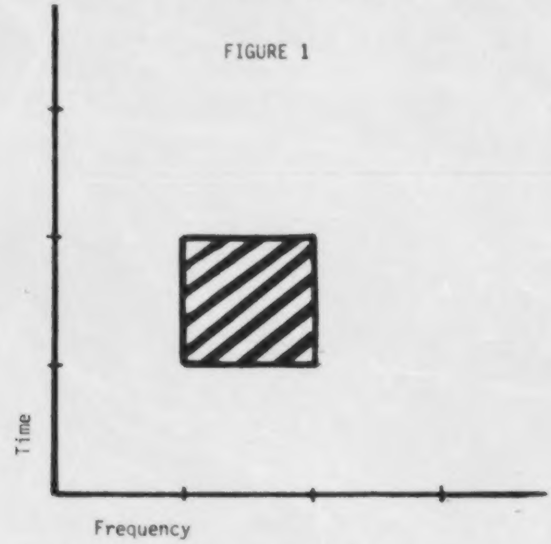


FIGURE 1

The first point is that this area should be reduced to a minimum since large values of the product will always be more costly than smaller values, that is, the redundant information should be deleted when possible. Thus, in our example, the information transmitted by TV is 300 X larger than it need be. Technically, further reductions are possible since individual frames internally contain redundant information in general but we shall not belabor the point here.

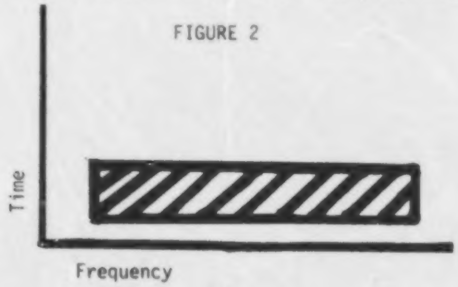


FIGURE 2

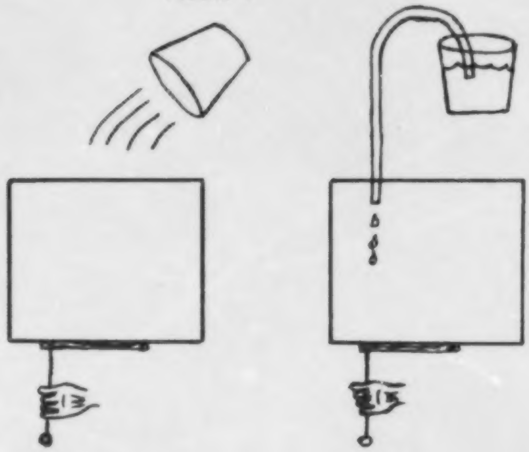
The second point is that technology can manipulate the form in which the information is sent. In Figure 2 we see that the same information can be sent in a shorter time provided that we utilize more of the channel bandwidth. This permits use of the channel in the time-division-multiplex (TDM) mode. For example, if the unit of information is one TV frame, each user can transmit one frame in 1/30 second by using the full bandwidth. We have glossed over some technical details such as how each user identifies which frames are "his" and how these frames are grabbed, stored and displayed. This is frequently referred to as a "frame snatch" or "frame-grabber" mode of operation.

FIGURE 3
Time
Frequency

In Figure 3 we see that the same information can be sent over a narrower-band channel utilized for a longer period of time. Splitting a given channel up into narrower frequency bands is use of the channel in the frequency-division-multiplex (FDM) mode. Here again, if we use the example of one TV frame, a user can transmit one frame in 1 second by using 1/30 of the bandwidth or in 33 seconds by using (approximately) 1/1000 of the bandwidth. This ability to adjust the rate of transmission of a frame to accommodate the channel is what we call the "controlled-scan televideo" (CSTV) technique. When we restrict the speed to a slow rate the technique also goes by the name of "slow-scan TV" (SSTV). Since there is approximately a factor of 1000 between the bandwidths of television channels and audio channels such as telephone lines, we see that an ordinary telephone line suffices to transmit a frame in about 33 seconds.

We note that the technical detail here is the ability to send the information in pieces over the time the channel is employed, accumulate the pieces, reconstitute the original information and display it in the original form. We wish to emphasize that the systems capability required, once the information is stored, to maintain and display the information in its original form is the same as that in the frame-snatch mode. The front-ends are different and may be epitomized by Figure 4 where the reservoir (frame memory) is filled either by dumping a bucket of water (frame-snatch mode utilizing a broad-band channel for a short period of time) or by siphoning the water through a narrow pipe (slow-scan mode utilizing a narrow-band channel for a longer period of time). The rest of the technology is essentially identical.

FIGURE 4



There is complete interchangeability between all forms of information: they can all be encoded into electronic form. While this is especially obvious when considered in terms of digital encoding, it is also true for analog techniques. The following list shows the actual implementation of two different forms of information in terms of different configurations (with the same time-bandwidth product):

INFORMATION	TIME	X	BANDWIDTH
1 Video frame:	1/30 second	X	(TV Channel)
	60 second	X	(Teleph.Channel)
	6 second	X	(SCA FM Channel)
16 seconds of audio:	16 second	X	(Teleph.Channel)
	1/30 second	X	(TV Channel)

II. Teleconferencing Mode

Before we can address the utility of these ideas in the general area of teleconferencing we must recognize that there are categories of conferencing function which should, perhaps, be recognized lest we fail in a vain attempt to be all things to all people. We shall arbitrarily divide the functioning of conferences into three modes, which we shall call "executive", "presentation", and "working session". This is certainly somewhat simplistic and arbitrary, but it may have some utility in discussion. It should also be noted that our categorization has a parallel in the hierarchical structure of many organizations.

Executive This category derives its name from the fact that high-level executive interactions are frequently of this type. It usually involves a small number of persons; frequently 3-5 people, sometimes two with staff backup. Personal contact is the goal, being an affective interaction rather than an informational one. Visual aids are not usually employed but "body language", facial expressions, and vocal inflections are important. It is frequently the case that communication of credibility is more important than the communication of information. Job interviews are frequently of this type as are initial meetings of people who have not met before.

Presentation This category of conference usually involves one person addressing n persons who can ask questions and make comments. The person "having the floor" uses visual aids: overhead projector, viewgraphs, slides, charts, etc. Color is frequently recommended for impact, even if not necessary for delineation of information. (Some of the educational literature warns of the diversionary effects of color for its own sake. One must be constantly aware of the danger of "expressing the speaker's creativity rather than being concerned exclusively with the impact on the audience"). Visual information is essentially one-way (1 to n) with audio interaction fully bilateral. Visuals need not have resolution sufficient to read a full printed page. In fact, visuals for presentations should not be too complex nor should there be too many. Neither should they change too rapidly. Usually, "presentations" require preparation.

Working Session This is always fully interactive and usually democratically so. It occurs among peers and tends to be informal. The people involved know each other to some extent, frequently very well. The number of persons involved may be as few as two or as many as 20. (Recalling the old saw that a "camel is a racehorse designed by a committee" reminds us that there are practical limits to the number of people who can profitably work together in a fully interactive manner.) Visuals are important (pictures, graphics, equations, numbers, computer printouts, text, documents, instruments or objects, etc.) and are fully multilateral. That is, the visuals may originate with any of the participants. Sometimes a working session must result in a written draft or recorded consensus. The ability to read a printed page is sometimes important here.

There are several points which are relevant here. First, we are interested in the extent to which teleconferencing, especially of the cost-effective sort we are most concerned with, can substitute for travel to effectuate in-person meetings. The limitations of a still-picture system are least noticeable when the contact is predominantly informational or cognitive rather than affective. We would, therefore, expect that the presentation and working-session type conferences lend themselves most readily to CSTV techniques. Our experience in several teleconferencing experiments bears out this expectation as to the adequacy and effectiveness in these categories. Certain attention to detail and important modifications are necessary to produce these empirical results which are more sanguine even than others reported[1] using similar equipment.

The situation is less clear with respect to executive-type conferences and we have little experience with assessing the limitations of the technique in situations where one is often concerned with evaluating the person making a presentation as much as the detail of the presentation. Naively, one might expect that personal contact is absolutely required and that only a broadband, motion-television system could suffice to simulate the personal interview situation as closely as possible. One might want full-color motion-television to "see the countenance pale, the hands tremble, and the beads of sweat form". On the other hand, we shall at least mention later some considerations which might militate in favor of a more limited system having actual advantages. Considerations of possible advantage aside, let us keep in mind that executive-type conferencing is perceived to be more important as one looks higher in an organizational hierarchy. While it is true that higher-level management tends to travel more per capita for the purpose of having meetings, it is also the case that most organizations have many more indians than chiefs and the major part of the travel occurring in an organization is done by the scientists, engineers and middle managers who are concerned with the actual work on projects rather than by the high-level management who are more concerned with making the decisions as to resource allocation in different areas. Perhaps the most important caveat to be kept in mind is that a teleconferencing capability such as we are concerned with constitutes a supplement to personal travel. There are trips which are foregone because of inconvenience and expense and there are interactions which are never made which might have resulted in some productive work. We thus must add the "lost opportunity" cost to the other costs of travel although it will always be difficult to quantify this consideration.

III. A Model for Education

We consider the model of a professor and a class of about 25 students to be a good one for our discussion. We believe that the essence of the situation is the interactive relationship between the teacher and the students and, we should not forget, among the students. We can easily argue for a set of criteria. We wish to provide to students who are off-campus the essence of what has traditionally been available on campus. Further, we wish to do this in ways which do not require large perturbations in the procedures familiar to both professors and students. The essence certainly includes the ability to interact; this means that two-way voice contact is an absolute necessity (including the ability of the students to communicate with each other). We take as our model of the classroom one in which the professor communicates via voice and an overhead projector. Harking back to the blackboard is too retrograde a step! Scientific conferences have almost totally eschewed the blackboard in favor of the overhead projector (and slides) and the trend is the same in the classroom. One has at least part of the armamentarium of visual aids available today: the ability to write in real time (as with a blackboard) but also the ability to pre-prepare material, use typewritten text, graphical aids, and pictures.

We also make two assumptions. Using our model, one is quite good: motion is not needed in the classroom for presenting information. The second is more arguable: motion is not needed to provide whatever component of affective interaction between professor and student may be important in creating the process of instruction. The literature[2] (e.g. see Travers (1967)) appears to bear this out. Some have even gone so far as to observe that motion may be more often a distraction than a help. The assumption is certainly more plausible in the situation of advanced university-level courses and mature, continuing education students. This assumption appears validated in work done at Northwestern University both with Northwestern resident students and with graduate engineers employed at an industrial location some 25 miles from campus. This work is described here and elsewhere[3]

We believe, in general, that information transfer alone, together with the necessary intellectual interaction to make instruction occur, does not require motion. Motion is usually required only when it is desired to elicit an emotional response. In the classroom, it is only those rare, peculiarly animated and stimulating professors with a unique teaching style who perform much of their job requiring motion. Even here, it is perhaps the case that the "extra" provided by these, often popular professors, is more in the sphere of entertainment than instruction. For the vast majority of cases, one is as often likely to observe a professor's "tic" as his animation and, so, the ability to see the professor "move" may be obviated.

We are now at the point of defining a system to provide off-campus education where the instructor is temporally but not spatially present. It must be interactive with two-way voice (as in a classroom). It should provide the ability to display visuals, both pre-prepared and constructed in real-time in response to questions or a perceived need (as in a classroom with an overhead projector). It need not, however, display motion (again, as in most classrooms). It should be available wherever the students are and, ideally, it should be possible to teach students who are not all in one place. Further, to help educational "productivity", it would be desirable to load on-campus classes incrementally with students from their off-campus locations. We have in mind that the total of students, both on-and off-campus, would be less than 50 and, preferably, about 25. This is to foster interaction which declines with both too few and too many students.

At Northwestern University, we have experimented with teaching via SSTV using primarily RCA Videovoice equipment and these experiments are more thoroughly described elsewhere[3]. Likewise, the equipment currently available is describe elsewhere[4] but we may summarize the system used. RCA Videovoice provides a transceiver capability at each terminal with full TV resolution possible (nominally 525 lines but actually about 340 lines, as is the case for home TV) with a transmission time of 60 seconds. Another option is a "freeze-frame" mode, which stops any movement much as a snapshot does and which has half the vertical resolution but may be transmitted in 30 seconds. During a transmission, the screen at both the transmitter end and the receiver end goes blank. This is an unfortunate feature of the system design which is a function of RCA's use of a scan-converter storage tube as the memory element which cannot both read and write at the same time. Colorado Video's equipment, based on a video disc, has somewhat inferior resolution and transmission-time features but "paints" the new picture over the old one in vertical strips moving from left to right. The LANTEL (Los Alamos-Northwestern TELevideo) System prototype paints the new picture on top of the old one in horizontal stripes from the top down. The blanking feature of the RCA system was modified by us in a later experiment in a way which should be done in more ideal systems.

The gray scale and resolutions were compatible with usual home TV standards and were more than adequate for the purposes of teaching courses in physics and chemical engineering. Our standard mode quickly became the 30-second, frozen-frame, half-resolution transmission. Lower resolution yet and two-level gray scale (instead of the full gray scale of about 16 levels) would have sufficed for most of our classroom transmissions of a mathematical nature.

The first concern was how to bridge the 30-second "gap". This was easily done by "talking" and making a special effort to "interact" with the students during the deadtime. This was, of course, possible because of our use of two telephone lines for all these tests: one for audio, the other for video. This is, in fact, not necessary since the video channel is not in use much of the time. It is technically possible to "time share" the audio channel for the occasional video uses in such a way that the student is not aware of the "gaps". This has not yet been implemented in an SSTV system but the technology is straightforward, if nontrivial, to provide this "voice-over-video" capability for one telephone line. This is part of our ultimate desideratum of a one-unit-per-person system for students in their individual homes.

During the transmission time, discussion was continued about the picture which had been displayed and was initiated about the picture in the process of being transmitted.

Despite this straightforward solution, which was operationally satisfactory during our on-campus experiments, there is a technical one which was implemented during a four-week experiment in which a course in Human Factors Engineering was taught during 12 lunch hours by a professor at Northwestern in Evanston, Illinois to students at Motorola's Research Center in Schaumburg, Illinois, about 25 miles away. During the on-campus experiments, we determined that the 30-second delay in the visual transmission was acceptable to the student if the teacher accommodated to the medium by using verbal discussion to finish a previous point or to prepare the student for the next transmitted visual. Nevertheless, students indicated that they would like to see the last frame of video retained. That is, there is merit to having both the current picture and the one just previous. This advance in the system technology requires additional memory. Because we project memory to become increasingly economical in the future, we decided to add this feature for the Motorola demonstration on an ad hoc basis. We added additional memory at the receiver end in the form of an Hitachi Disc with appropriate switching.

The system at the remote classroom receiver now had two display monitors, one for "current video" and one for "previous frame". It is possible to operate the memories and displays as follows: at initiation of a new video transmission, both displays are switched to observe the most recent previous frame (for the RCA system, this obviates the annoyance of the screen going blank); upon receipt of the full frame into the primary memory, the primary display is switched to observe the new frame upon teacher command or when the frame is complete.

There are several advantages to this specification. Most important, the teacher is able to present lecture material without the student necessarily realizing the existence of a finite video transmission time. All that is required is that the teacher know what is to be transmitted 30 seconds before it is to be shown. The transmission occurs sub rosa and the new frame "appears" instantly (in 1/30 second). The only circumstance where the student would notice the delay is in response to a specific question or in a clumsy teacher presentation. In any case, the acceptability of the delay has been established. An additional advantage, which came out during our field test, was the instructor's ability to transmit two video frames, when desired, and talk about both simultaneously (although they were actually transmitted sequentially).

One need came to the fore almost immediately in actual usage: the absolute requirement for quality audio. Since the prime mode of interacting is aural, it is important that audio quality be maximized. This is true both for the student's ability to hear the professor and the professor's ability to hear the students (and the student's ability to hear each other if they are in different locations). We quickly adopted the use of lavalier microphones for the professor, Bell System Model 50A Portable Conference Sets for both studio- and remote-classrooms, and voice-actuated microphones with constant-level controls.

Concern about the need for a professor to make great perturbations in his teaching style in accommodating to the SSTV format was alleviated during the Motorola test. The instructor was a brilliant teacher but one who held no special brief for this sort of media teaching. Accordingly, he pushed the medium very hard with little attempt at accommodation to its possible limitations. Lectures were not carefully prepared, he used figures from thick books, scribbled on cards during the lecture for transmission to response to questions (and, indeed, as part of the main lecture) and mixed drawings of different sizes and aspect ratios. At times, the lectures were mostly aural, necessitating pictorials of the professor rather than course-related material to "fill the gaps". The student-camera-operator was more than equal to the task (using a zoom lens on the TV camera) and both the medium and the last-frame feature came through the test successfully.

Even before the last lecture, the Training Director of Motorola "accepted" the medium. That is, Motorola was willing to pay tuition for degree programs if Northwestern's Technological Institute could deliver the course material largely by SSTV. During the last period, a crude student "evaluation" was done. Most significant is the following:

1) More than 80% of the students felt that they had learned as much in the SSTV lectures as they would have in the same time spent in a live lecture.

2) 90% strongly preferred to be able to stay in the plant to take courses.

3) Over 70% thought the last-frame feature was an important addition.

4) 90% of the class was satisfied with the tonal quality of the telephone audio.

5) 90% said that the video picture helped to direct and focus their attention for enhanced learning even when the picture was not absolutely essential for the presentation. Video tapes of the remote classroom situation show students asking questions of the (still) monitor as if it were the professor (even when the monitor was showing a still picture of something other than the professor).

6) 60% would pay tuition money themselves to receive courses by this medium.

7) The members of the class were split as to whether they thought motion was necessary. We think this was not due to the demands of the course but, rather, to the erroneous preconception of the class that they would be seeing CCTV!

8) The class was not entirely comfortable with SSTV. About half said they "didn't like it" but couldn't pinpoint why.

We think the individual student evaluations supported the medium. In the design of this minicourse, the students *never* met the instructor in person; they were not *prepared* for the medium (most expecting CCTV); they participated voluntarily, on their own time, and without formal course credit. Perhaps most significant of all, almost every student stayed with the class sessions from the first to the last one.

We should stress that courses taught by any medium should be carefully prepared and should utilize whatever is possible in the way of prepared material to be handed out in advance of the class: lecture notes, books, problems, pictures, etc. It is the "real-time"aspect of classes which the medium provides. Media teaching points out most forcefully the stupidity of much *classroom* technique, wherein teachers copy material *from* their notes onto a blackboard from which students dutifully copy the material into their notebooks without too much thought intervening. Media teaching points up the fact that classroom time is precious and should not be spent on secretarial functions. Media teaching of this sort is good experience for *any* teacher in improving and understanding classroom technique. Compared with ITV, SSTV has an additional advantage which came out during interviews with individual faculty members who were exposed to the system. Many faculty people are not partial to TV teaching because they feel exposed and ill-at-ease before the camera's all-seeing eye. SSTV severely delimits this "invasion of the classroom" and should be easier for many faculty members to adjust to than an ordinary CCTV.

IV. Features of CSTV - descriptive and normative

In our previous description we are aiming at a system which can use the ordinary telephone network to transmit *still* pictures and two-way voice. Television pictures *are* familiar and acceptable to almost everyone and suggest the television set as the display of choice. Telephones and television sets are essentially ubiquitous and the existing 1/8 Billion telephones in the U.S. are in place, reliable and interconnectible. If all our transmissions, both audio and visual, can be sent over ordinary telephone lines, we recognize that conference-call features, high fidelity gear and audio recording equipment *already available at consumer-type prices* become instantly available to a narrow-band audio-visual telecommunications system. We have reviewed elsewhere various techniques for doing this.

We believe that the system which has the most general applicability, and which will benefit from economies of scale resulting from applications in many other areas, is CSTV. Here, the input instrument is a TV camera but the transmission medium may be the telephone.

We can review again the simple argument which suffices to show that televideo can be used over ordinary telephone lines. A communications channel is able to carry information in much the same way that a pipe is able to carry water. The carrying capacity of a communications channel is measured by its "bandwidth": the range of frequencies which it can transmit without substantial distortion and loss. The unit of frequency is the "hertz" which is equivalent to the older unit, "cycles per second". A voice-grade telephone circuit has very approximately a bandwidth of about 4.5 KHz (where we denote "thousands of hertz" by "KHz"). That is, it carries only audio frequencies. We may call this a narrow-band channel. An FM-radio channel, similarly, is also "narrow", being about 15KHz wide. A black-and-white TV channel, on the other hand, transmits 30 frames per second and requires a bandwidth of about 4.5 MHz ("millions of hertz"). This may be called a "broadband channel". Speaking roughly, a full television picture (with motion) requires the equivalent of about 1000 voice-grade telephone channels. Bell's Picturephone is no help in this regard, being a low-resolution television system which presently requires about 300 voice-grade equivalents. We stress the well-known fact that Bell's Picturephone cannot be transmitted over ordinary telephone circuits, since it is intrinsically a 1-MHz system. Suppose, however, that we do not send 30 frames per second but, rather, only one new picture in 33 seconds. We thus see that the information rate goes down by the product of 30X33, or almost 1000. This lower rate can, indeed, be accommodated by an ordinary voice-grade telephone circuit. All we have given up is the ability to transmit motion and the ability to change pictures more often than once every 33 seconds.

We should mention the possibility of redundancy-elimination as discussed earlier. Because of the large redundancy of information between most TV frames, it is conjectured that Bell's Picturephone might be "squeezed down" to fit 10-20 voice-grade telephone lines eventually. Likewise, such projects as GE's Sampledot System promise to provide some compression of bandwidth for ordinary telvision. Present techniques have indicated approximately a factor of 4 compression due to frame-to-frame redundancy and another factor of two compression due to intra-frame redundancy. Interestingly enough, the hardware required for redundancy elimination is very similar to the configuration required for CSTV and the techniques may all be expected to converge. The point now, however, is that we recognize the frame-to-frame redundancy and eliminate it entirely by eschewing motion. The intra-frame redundancy can be eliminated as well with televideo as with television (actually more easily).

The issue of resolution is a more important one. This refers to the ability of a picture to discern and distinguish detail. Very roughly we may speak of the number of picture elements (PELS) contained in a picture. Each picture element may be assigned a measure of its color or, in the case of black-and-white, its gray scale. This permits the rendition of a picture, scene or object which has shading in much the same way that a photograph does. The number of TV lines is roughly proportional to the square root of the number of associated pels. Thus, a TV system with 500 line resolution has 4 X the number of pels (and, hence, four times the information) contained in a picture with 250 line resolution. American NTSC television has of the order of 500 (nominal) line resolution. It contains about 1/4 the resolution needed to read a page of typescript or a page from a printed book (which requires about 1000-1200 line resolution). Bell's Picturephone is DOWN by another factor of four from NTSC standards. That is, Picturephone pictures contain about 1/4 the information of a standard TV picture and about 1/16 of what is required to read text.

When we discuss the fact that a still-frame of video can be transmitted over a telephone line in about 33 seconds, we are referring to a *new*, standard American TV frame. Actually, we can get *by* in most circumstances with a picture whose resolution may be less than that of a TV picture and this lower-resolution picture may be transmitted proportionately faster. For example, a still picture of Picturephone-type resolution could be transmitted in abcut 8 seconds. On the other hand, a picture which we should like to be of *higher* resolution than ordinary TV can be transmitted in proportionately more time. *This actually provides a flexibility which an ordinary television channel does not have.*

We may ask why this technique has not already been used widely since people have been trying to squeeze pictures through telephone channels since the beginning of the telephone and telegraph. Variations of the basic idea have, in fact, been in use. However, some new technological developments have made this technique feasible and attractive only within the recent past. These pertain both to the wide acceptance of the television display and the development of "memory systems" for storing the large amount of information contained in a picture. Whereas in a television picture, the information is essentially stored in the channel, in that it is used as fast as it is transmitted, the "controlled-scan" part of the description implies that the picture is sent piece-by-piece over the narrow-band channel (at whatever rate is characteristic of that channel) which means that the picture must be stored at the receiver end and, when the picture is complete, displayed. We can carry further our analogy of Figure 4 to filling a water reservoir with a trickle of water from a thin hose. When the reservoir is full, the water may all be dumped out at a high rate. At the receiver end, the memory unit must serve several purposes: it must accept the picture information at a "slow" rate appropriate to the telephone line; it must accumulate and store this information in the proper sequence until the picture is complete; it must then spew the information out rapidly and repetitively (at video rates) to "refresh" a television set so as to maintain a flicker-free (but stationary) picture on the TV set. Memories which have been used to this end include a slowly-decaying-phosphor CRT (as on a radar screen), magnetic video discs, scan converter storage tubes, and digital computer memories. It is now possible to build a "box", about the size of a breadbox, which connects an ordinary telephone to an ordinary TV set and which contains no moving or glass parts (i.e. completely "solid-state"). At the other end, we have a "black box" which connects a TV camera to the telephone. The ever-decreasing cost and spatial volume of memory makes more capability possible. The transmission of a completely new frame takes 33 seconds over a telephone line. However, with multiple memory capability and some electronic sophistication, it is possible to "update" a picture in considerably less time. To move a pointer in real time or make underlinings, circles etc. would take only a second or two. Writing could occur essentially in real time if that were deemed to be important.

The "appearance" of instantaneous transmission of still-pictures can be effected by the use of multiple memories and the "foresight" to plan the transmission of a picture 60 seconds in advance of its complete receipt. From the vantage point of students, the CSTV system in teaching has much the appearance of CCTV. From the point of view of the instructor, however, CSTV is much easier to use, lending itself quite readily to his usual style and mode of teaching. This obviates a salient cost of media teaching: the development of new software. All the flexibility of an overhead projector is available with the additional convenience of being able to point an on-line camera at an object, person, text or picture and display it to his students. Another salient feature of CSTV is the flexibility to vary the resolution of the visuals employed. It is possible to display higher resolution than ordinary CCTV or broadcast TV permits. Certain special modes of operation permit either the use of high resolution monitors to read text or the use of ordinary TV monitors to do the same. The CSTV communications system is available wherever there is a telephone and the whole transmission, both visual and audio, can be recorded on an inexpensive audio cassette. The universality of application of these techniques in many fields augurs well for continuing reduction in cost as economies of scale take hold.

V. Remote Library Service and Other Data Access

Libraries remain our main means of storing information in forms which can be conveniently retrieved by scholars. The scope of library service has been expanded to include audio-visual materials in addition to the standard fare of books, journals, reports, and written/printed documents of all sorts. We shall consider the concept of library service to encompass any and all types of data. We have seen that they can all be expressed, stored and delivered in the same way.

There are two issues which are important. First is the need for inter-institutional sharing of these expensive resources. Second is the need for scholars (researchers, students, etc.), who are not geographically near to a library, to have as full access as possible to the materials readily available to scholars who are local. There is the "democratic" goal of providing equal (or, as equal as possible) access to scholarly materials by persons wherever they may be. There is also the practical circumstance that the scholarly community cannot afford the economic cost of too much redundancy. It is becoming increasingly difficult for all libraries to maintain complete collections of journals and the problem is especially acute with respect to specialized materials needed by only a few scholars.

There is the concomitant problem of fashioning a mechanism for providing dissemination of scholarly information which, by its specialized nature, does not justify even the scale required by ordinary publishing modalities. The "preprint system" and the "invisible college" of scholars in the same narrow speciality are ad hoc responses to this need but this mechanism is highly undemocratic and too unstructured to be acceptable as a solution to the problem. We here shall describe a system whereby telecommunications can be used to share institutional resources, to make all the resources of any and all libraries available to any scholar no matter what his/her location and to provide a means for "micropublishing" information which will avoid the inappropriate costs of the usual print media and yet will maintain the accessibility needed. On the U.S. scene, there are additional problems with customary modes of operation which impend because of changes in the U.S. copyright laws. We shall describe a system which certainly does not circumvent the law but which provides a mechanism for accommodating to it in a way which may be acceptable to libraries, scholars and publishers/authors.

We envisage a tiered system with primary libraries, secondary and, perhaps, tertiary libraries, etc. and, finally, the ultimate user in his/her office. The primary libraries would consist of national resource centers such as the Library of Congress and major collections, especially those with unique materials. The secondary and tertiary libraries would have significant collections of their own (less so as we proceed down the hierarchy) but which would most importantly serve their local communities as secondary and tertiary distribution points for library materials. The individual scholar would communicate either to a secondary/tertiary center or, possibly, directly to the primary source. The specific route would be determined solely by economics, availability of equipment and communications channels and the need for speed.

Let us review the present and currently-projected situation to see why any changes are needed. We have developed, and are continuing to develop, modern and powerful methods for doing bibliographic searching of various data bases. However, once the needed material is identified (and this can be done within hours and, utilizing only the telephone, from essentially any part of the U.S.), there is no follow-up document delivery capability which is comparable. Ben Jacobson of the Northwestern University Library has referred to "20th century search procedures and medieval distribution methods".

The usual procedure involves several steps:

1) Reference interview with a professional librarian

2) Use of a computerized data base to determine the references which one thinks one needs (including materials which reading of the abstract, table of contents or a few pages would eliminate from consideration)

3) Determination of which library or data center has the desired materials

4) Ascertaining if the library in 3) has the material available

5) Obtaining the material by interlibrary loan of the original material, photocopy or microfiche copy

6) Awaiting physical delivery, usually by the U.S. Postal Service (or worse).

Step (1) is done reasonably well with present-day methods. For people remote from the librarian, the telephone works reasonably well but could certainly benefit from a visual component, especially in technical fields. Here a teleconferencing capability to supplement the usual telephone would be of value.

Step (2) is done superbly well at the present time and the situation continues to improve. This step frequently involves only minutes or hours to accomplish. However, the material identified by Step (2) is frequently not useful and this fact can be ascertained by skimming or browsing through the document.

Step (3) is presently done in ways which bear improvement. The reference librarian or one's own judgment can usually provide good input as to likely repositories of specific identified documents. The data bases could certainly be modified (albeit at some not inconsiderable expense) to include this information.

Step (4) is done well only by sophisticated libraries. It has been estimated that considerably less than a majority of the libraries in the U.S. can tell conveniently (without looking for the document in the place it is supposed to be) whether an item in their catalogued collection is available at any given time. Some difficulties afflict even the most sophisticated libraries. The document may be signed out to a borrower, at the bindery, stolen, misshelved or in process. There is, in fact, a distinct problem involved with the increasing power of the search procedures and the increasing mismatch with the follow-up. There is the danger of increased frustration due to enhanced expectation without commensurate ability to deliver. The use of interlibrary loans of original materials is actually counter-productive in that useful materials (identified by increasingly-many users with access to search procedures) will be unavailable to all users after the first one has removed them from circulation. The clear answer to the difficulties involved in Step (4) is to make the primary library a "closed-stack" system with the original materials not circulating beyond the direct control of the professional library staff. At one stroke, all the factors militating against availability of catalogued material would vanish. Of course, we must provide alternative means for users to access these materials.

Step (5), the interlibrary loan problem (described above) aside, is very labor-intensive. At present, some person must physically remove the document desired from its repository and make a copy of it. This first step cannot be eliminated by any system, given that the primary source material is initially in traditional form. However, we can hope to eliminate the need to duplicate this wasteful and time-consuming operation a second, third, etc. time. The making of microfiche copies already has this convenient feature. We should at least like to configure a system which does not need to return to "square one" each time a document is called for. It would further be most useful if the second (and subsequent) call-up were done in a machine-accessible, if not machine-readable, mode which lends itself to automation. Not only would this computer-accessed mode permit labor economies; it would also provide a means of accommodating to the copyright laws (and preventing the present system of inter-library loan and photocopying from collapsing entirely) by permitting accurate bookkeeping of accesses (and payment of appropriate royalties to publishers)for full-text transfers while providing open access to needed materials by users.

Step (6) is presently such an abomination that it bears little comment. The material must be packaged before being committed to the not-so-tender ministrations of the Postal Service and the delays and expense are considerable. We are at least solaced by the fact that the U.S. Postal Service usually produces delays and damage only; foreign services in Less Developed Countries have a very good record of losing the materials entirely.

Some Concepts We should distinguish certain ideas which bear emphasis. We refer to machine-accessible as contrasted with machine-readable. Even for the future, not all materials will ever be machine-readable although it is possible that text-only journals could be provided in this form. The enormous body of existing literature cannot be attacked from the machine readable point of view and pictures, complicated graphs and audio-visual materials will always be difficult to store and retrieve in a machine-readable fashion. Machine-accessible, on the other hand, refers to the ability of a computer to locate and access stored information. We suggest that a general scheme, which could be implemented at the present time, is to consider a videofile (either on 2" videotape, magnetic discs, videodiscs of whatever sort achieves success in the market-place, etc.) as the primary storage medium (after the first access of the material by a user). We have seen earlier that all kinds of information can be stored and transmitted in electronic form and that the storage can be made increasingly dense with more sophistication in redundancy elimination techniques. Most important, the video frames (of written material, audio, etc.) can be accessed by computer control on an individual frame basis. We must, of course, provide the flexibility to store frames of sufficient resolution to encompass all the material we are likely to be interested in.

We must distinguish real-time and quasi-real-time. It is frequently not necessary to deliver documents or materials in real time, which is arbitrarily defined to be receipt within minutes of request. Quasi-real-time refers to delivery sufficiently soon after an expressed request for information that its receipt is timely and useful. As an example, we submit that days or weeks is often too long but that overnight delivery often would constitute quasi-real-time response. This distinction is very important because cost-effectiveness considerations militate in favor of using whatever communications channels are available, especially those which are under-utilized and cheap. At present, the vast telephone network of the U.S. is fantastically underutilized between the hours of 2 a.m. and 8 a.m. (approximately, since the time zones create some overlap at the ends). This is an available resource which should be employed even at existing rates. Another issue, of course, is whether the general good would not be well-served by having the telephone long-distance tariffs break at an additional point. They presently change at 8 a.m., 5 p.m., and 11 p.m. and we would suggest that another break, at 2 a.m. (or some time to be determined), might be in the interests of the nation and the telephone companies.

Another concept which is important for the issue of document delivery is that of resolution. We are considering video frames of flexible resolution and gray-scale (even color) capability. PROJECT INTREX,[5] among others, has identified 1200-2000 TV line resolutions as adequate for almost all library materials. We must provide the ability to store materials at this resolution and the ability to display them or, alternatively, reconstitute them at this resolution. When we deal with text only, there is another alternative as well.

There is actually no reason to reproduce exactly the format of present book technology when we enter the electronic age. Certainly there is nothing sacred about the need to turn pages although, should studies bear out that the tactile sensation is important, technology can provide that as well. In particular, the need for 1200 line resolution is predicated on the fact that most books involve text of about 80 characters per line. A TV display of American (NTSC) standards can display only about 40 characters per line. Interestingly enough, studies have indicated that 40 characters per line is more acceptable to readers than is the 80-standard. The data do not immediately scale to TV displays, of course, but Paterson and Tinker and Sir Cyril Burt have published studies[6] of legibility tests wherein it appears that 40 characters per line is optimal. Whether these tests carry over or not, it is clearly the case that newspaper compositors use the rule-of-thumb that one-and-one-half alphabets is what is best for newspaper columns. These raise not only the possibility of reformatting texts to utilize 40 characters per line but the possible advantage of so doing. It is straightforward to reconfigure standard text to this format and constitute an infinite scroll, 40 characters wide. This technique, by the way, indicates that the telephone line is more than adequate to keep up with the capability of anyone but the most expert speed reader.

Configuration of a System We shall describe in what follows an example of how Controlled-Scan Tele-Video techniques can be applied to employ these concepts to provide a library distribution system which can provide a good match to the sophisticated search techniques presently deployed. We envisage the telephone system to be the primary means of interconnecting primary, secondary, tertiary, etc. libraries with each other and with users. We adopt several principles as design philosophy. Among these are the following:

1) Use the telephone system.

2) Use CRT displays as either the primary display mechanism or as an alternative to hard-copy. Standard TV sets would be especially desirable.

3) Utilize existing technology wherever possible. Especially avoid any electromechanical systems which have not already been highly developed by the commercial sphere.

4) Use sophisticated electronic techniques, especially microprocessors, wherever possible so long as the implementation can be accomplished through LSI (Large Scale Integrated circuit) technology. It is increasingly the case that the sophistication of electronic circuits is no longer a significant cost-determinant provided that sufficient market exists to justify the use of "chip" techniques.

5) Aim for a system which is both sufficient (to satisfy the user) and also minimal (does no more than it has to do in order to be cost-effective).

These have certain consequences which we can cite out of context. Audio cassettes can be employed as a storage medium, even for text and graphics, because of CSTV techniques. It provides certain disadvantages, as does the use of the telephone line, such as non-instantaneous accessing of information. However, speed of delivery may still be adequate when related to the very limited capability of human beings to absorb and assimilate information. A "browsing" capability is very important but it is probably not necessary to access a page of text in 1/60 sec. if it takes the person 30 seconds to read it. An ordinary audio cassette, 60 minutes long and costing under $1, can contain about 600 pages of black-and-white text with each page being presented on the screen about 6 seconds after the appropriate frame is located. Half-tone pages would reduce the number of pages and increase the time required to "read in" a page.

System Description We shall make reference to the schematic diagrams in Figures 5,6 and 7, where we have divided up the functioning of our Remote Library Service System into Production & Storage (at the primary and secondary library source locations), Distribution (either via the physical delivery of cassettes or by communication to and from secondary and tertiary library locations) and Display (at a local library location or in the user's office).

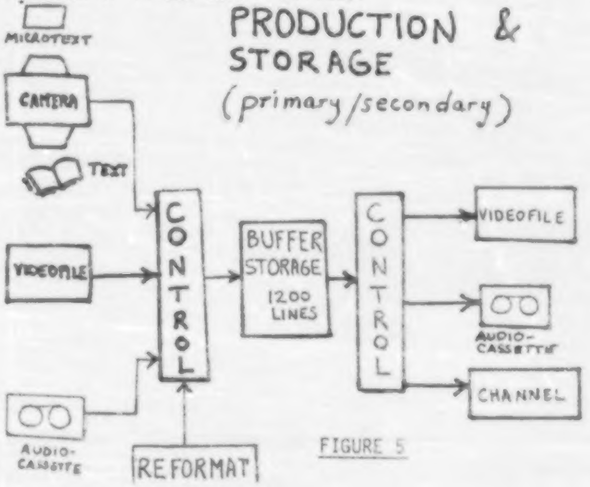


FIGURE 5

Figure 5 shows the elements of the production system. We cannot avoid the intervention of a human to get the material and bring it to a high-resolution camera system ONCE. Input from a non-electronic source can be either from the original text or from a microtext copy. At the primary library location, the material whould then always (in parallel) go into permanent (but erasable) form onto a computer-addressable videofile which is a dense, high-speed-access system for subsequent accessing of information. Individual pages can be accessed for "professional fair use", providing one means of accommodating to the copyright law. Alternative outputs would be onto audio cassettes or onto a channel for transmission in real time. Alternatively, of course, transmission could take place off-line to utilize idle channel capacity, for example, at night. The "Reformat" control would provide a simple means of accommodating pure-text to the 40-characters-per-line capability matched to 525 line NTSC TV standards. This would permit straightforward display on ordinary TV sets.

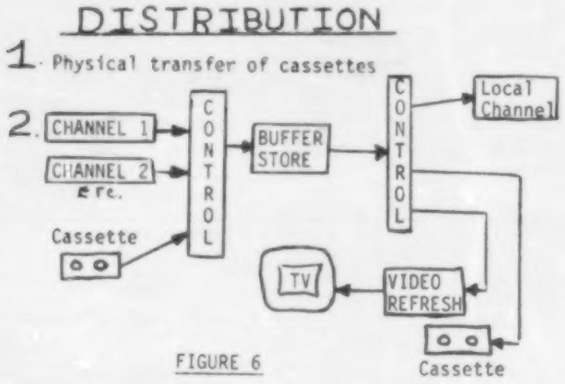


FIGURE 6

Figure 6 refers to the channel matching function of the secondary, etc. distribution centers. The material could be viewed in real-time on a TV display (either high-resolution or ordinary TV), an audio-cassette made or immediately retransmitted over a local channel. Thus, depending on the frequency of usage, a secondary library might find it advantageous to have a broad-band link with a primary library location and retransmit the needed information over local telephone lines to a tertiary library or to an individual user.

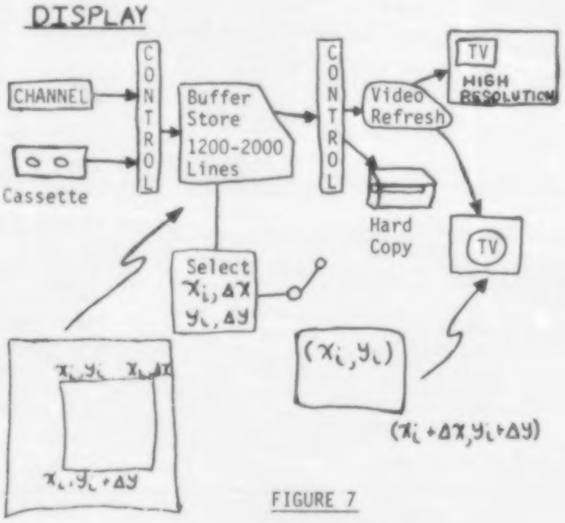


FIGURE 7

Figure 7 refers to the display capability which could exist at any of the possible locations: primary, secondary, etc., or individual user. The display could be on a high-resolution TV monitor (justifiable only at primary or secondary locations) or on an ordinary TV set, which would suit the individual user's office. Alternatively, there could be an off-line provision for making hard-copy for those of us who find new modes difficult to adjust to. The "joy-stick-mode" of operation permits the scanning of high-resolution material on a low-resolution display. The analogy is to a microscope: the TV set is used as a microscope-viewing window for the material stored in the buffer memory.

What is envisaged here is a rather dramatic departure from present modes of operation. It is believed that the individual user may be able to adapt to a mode wherein the documents are maintained in "softcopy format" on audio-cassettes. The full spectrum of devices developed for the home entertainment market could be employed here. The display, of course, is envisaged to be via TV monitor. However, pages could be referenced (by number and automatic forward-reverse reel control) and it is even possible to make written notations on the individual's copy of documents using a simple light-pen arrangement.

Certain human-factors and economic studies should be undertaken before these millennial developments can be expected to be available. However, the flexibility of these ideas militates in favor of some system such as this being produced in the not-too-distant future.

FOOTNOTES

* Copyright 1977

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COMPUTER CONTROL OF TELECONFERENCING

James R. Potter
Director of System Operation and Development
Indiana Higher Education Telecommunication System

James D. St. John
System Design Engineer
Indiana Higher Education Telecommunication System
Indianapolis, Indiana

Background

The Indiana Higher Education Telecommunication System (IHETS) was established in 1967 by action of the Indiana General Assembly to provide a structure through which the institutions of higher education in the state, public and private, might work together to satisfy their joint needs for telecommunication services. During the ten years of IHETS' existence several telecommunication systems and services have been established and operated to the benefit of its member institutions. These systems and services include:

- Closed-circuit, switched television network*
- Dial tandem telephone network
- Radio Network
- Teleprocessing* (automatic tape delay television system)
- Teleresponse* (student talkback system)
- Shared Telpak purchase agreement (voice and data circuits)
- Hard-copy message network*

IHETS is currently setting up a pilot voice conferencing network which will build on the Wisconsin experience with ETN and SEEN. We are also beginning a two-year program to develop and evaluate a tape television system called Tele-Library.

Network Design Philosophy

IHETS component networks and technical systems have been designed and developed around the following basic principles:

Reliability

Educational support systems must be reliable. They must not only work the first time a professor attempts to use them, but they must also work day after day, becoming as dependable as the heat and light systems in a typical classroom. Faculty confidence in media is in short supply, and there is usually good reason for this lack of confidence. New systems must earn faculty acceptance.

Flexibility

System flexibility is a top priority. In designing systems we attempt to anticipate future possibilities in addition to satisfying the immediate need. Systems are designed to keep as many options open as possible for future changes and growth.

Time Sharing

Sharing the use of a facility is a valuable technique for reducing the unit cost of system operation. Where user needs can be blended to share time on a facility, the efficiency of that facility can be enhanced. Hardware systems can also be integrated in some instances to minimize costs.

Users Need Help

The most flexible, reliable system will fail if users are not provided with the information and support necessary to assure proper system use. Users must be able to communicate with someone who will help solve technical and operational problems when these occur. The "call for help" procedure must be clear to all users and system personnel must be available to follow through on all problem situations immediately.

System Operation Continuously Monitored

System personnel must play an active role in monitoring system performance. Complete reliance on user trouble reports is not sufficient to assure network reliability primarily because user reports are most likely to occur immediately preceding or during intended system use, leaving little or no time to correct the problem before programming is affected. Moreover, users are often reluctant to report minor dissatisfactions with system performance. These then frequently become continuous irritants to users, fostering a negative attitude toward the technology. An automatic monitor and alarm system, however, will signal faults instantly, increasing the likelihood of correction with no loss of programming.

Routine Network Functions Automatic When Feasible

By automating routine switching and monitoring functions, technical personnel are left free to work with users when problem situations arise. Machines can usually perform routine operations better than people; on the other hand, a person experiencing difficulties with a technical system usually prefers to have a person come to his aid instead of a machine.

Microprocessor Control of Teleprocessing and Teleresponse

The technical details of two network sub-systems, Teleprocessing and Teleresponse, are described below. These systems were developed by the IHETS staff using microprocessor-based automatic control systems; an integrated approach has been taken to their design. They share intercity telephone lines and some electronics as well as the microprocessor control system. Plans for the future envision additional tasks for the control system, such as the control and monitoring of several supplemental television distribution facilities (ITFS and CATV) being constructed to extend the television network to additional service locations.

Microprocessor Use with Audio Conferencing

The ETN-type network currently starting as a pilot project will begin as a copy of the Wisconsin system. Later phases of this project, however, will involve the

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*Systems marked with an asterisk (*) in the above listing are controlled by computer.

use of microprocessors to add such features to the network as:

- Automatic monitoring of system operation
- Conference confidentiality
- Student feedback systems (tests, attitudes, etc.)
- Electronic graphics
- Hard-copy messages and automatic data collection
- Automatic network segmentation

Just how many of these features will be of value remains to be determined as the network develops. Until then we are keeping options open for adding these and perhaps other features as technology matures and needs become apparent.

Teleprocessing

The Teleprocessing project was initiated by IHETS to develop a means of increasing television network usage and to reduce scheduling conflicts arising from the limited number of network channels available, especially during daily peak usage periods.

Teleprocessing is a system of remotely-controlled video record/playback stations (Teleprocessors) which function under the control of a centrally-located computer. Since a substantial portion of the programming carried on the network is not live, Teleprocessing allows us to pre-transmit some material when the network channel is available, record it on a Teleprocessor at the intended receive location(s), then play it back at the regularly scheduled time when the network channel is being used for another, possibly live program. The system is operated entirely by remote control and appears, in effect, as a second incoming network channel at the receive location. FIGURE 1 illustrates a typical application of Teleprocessing to alleviate a scheduling conflict.

System Design Objectives

We determined that each Teleprocessor should have the capability of recording and playing back programs of up to two hours in length as well as storing two separate programs at each location. Another goal was full automation of the central control facility so that the IHETS control room operator could enter the Teleprocessing schedule in advance, with actual machine control handled by a computer, in a manner analogous to the operation of the video network itself. Finally, we felt it essential to provide a means of transmitting tally information from each Teleprocessor back to the central control computer to verify proper system operation.

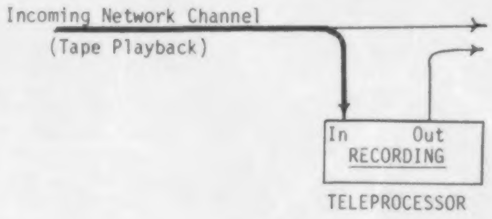
The U-matic 3/4-inch cassette format was ultimately selected for use in Teleprocessing. Use of a one-inch format VTR was considered but rejected because of the increased complexity involved in controlling the rewind and recueing of an open-reel machine. The cassette format was ideal in being a closed system, and the fact that the cassette machines were designed with a minimum of external adjustments, to facilitate their use by non-technical personnel, makes them well suited for operation in a long-term, hands-off environment.

Two VTRs are incorporated into each Teleprocessor to meet our objectives of two-hour record/playback capacity and ability to store two separate programs. Thus, the system as it is presently configured can store two separate programs one hour or less in length or one program of up to two hours' duration. In addition, the use of two VTRs provides a substantial backup capability in that the system can still function, in a limited mode, if one VTR becomes inoperable.

FIGURE 1

EXAMPLE OF TELEPROCESSING APPLICATION

Assume that a particular receive location, with only one incoming network channel, desires to receive two separate programs at the same time. If one of these programs is a videotape playback rather than a live broadcast, it can be transmitted at an earlier time when the network channel is not in use and recorded on the Teleprocessor at the receive location:



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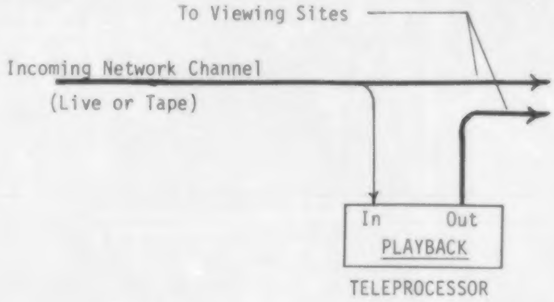
At the regularly scheduled program time, the second program, which may be live or taped, is sent via the regular network channel. Simultaneously, the Teleprocessor is commanded to play back the recording of the first program:



The VTRs and associated control and signal electronics are housed in a locked equipment rack to minimize the possibility of tampering. FIGURE 2 is a block diagram of the Teleprocessor.

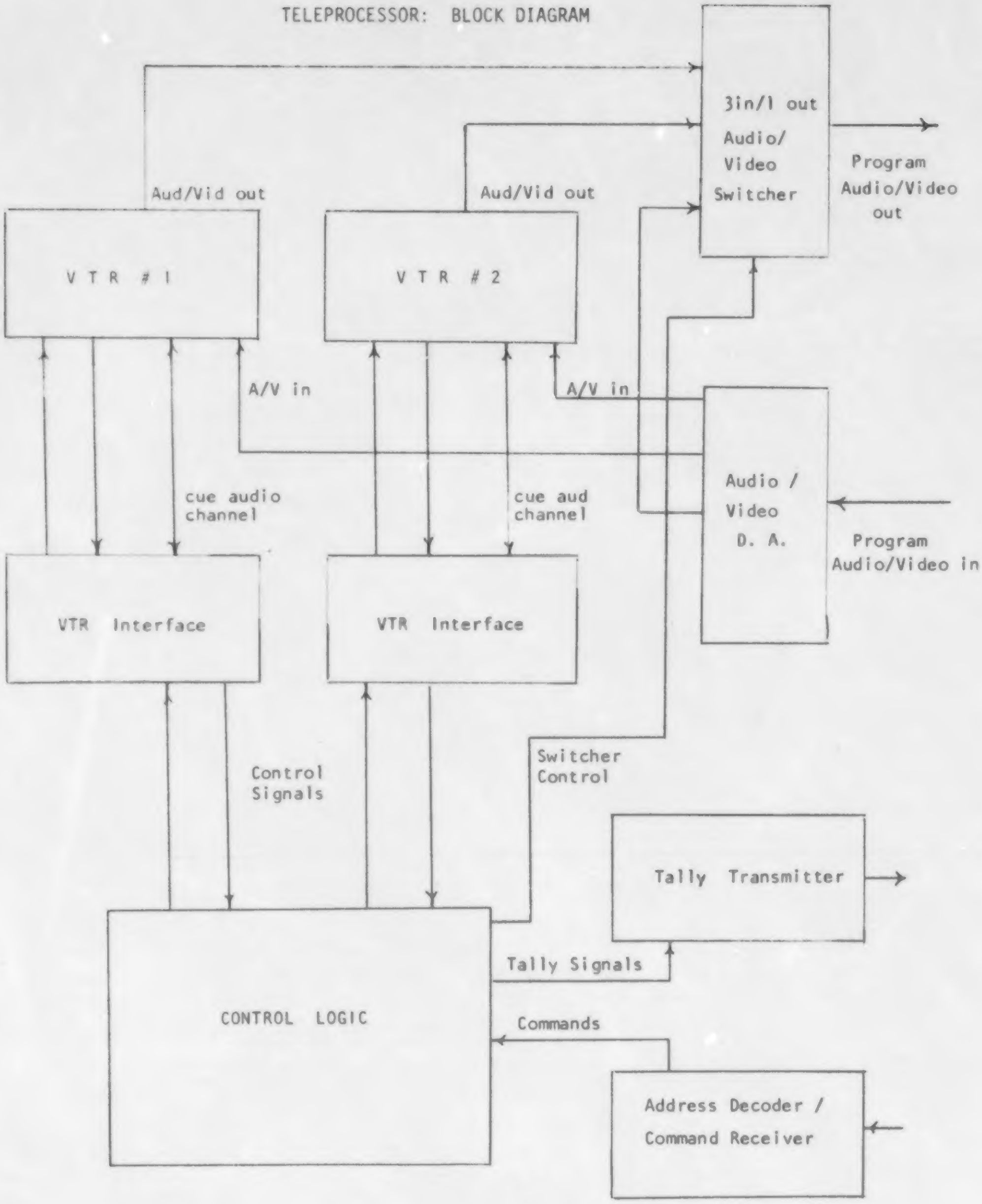
System Description

The program audio and video distribution and switching are handled by the two modules on the right-hand side of the diagram in FIGURE 2. The distribution amplifiers have three outputs: one for each VTR and one which drives the output switcher directly to provide an "E-E" signal during a recording or when neither machine is in use. The two remaining switcher inputs are connected directly to the two VTRs.

Each VTR is connected to the control system via a VTR interface module. The purpose of this module is effectively to mask the unique machine control and status signal characteristics of the particular VTR in order to present a standard signal configuration to the controller. This modular approach, in addition to being a servicing aid, increases the flexibility of the system and allows easy expansion or modification. As an example, the first Teleprocessors used the Sony VO-1600 VTR, while the latest units use the newer VO-2600. All that was required to accomplish this change was the

FIGURE 2

TELEPROCESSOR: BLOCK DIAGRAM


3in/1 out
Audio/
Video
Switcher
Program
Audio/Video
out
Aud/Vid out
Aud/Vid out
V T R # 1
V T R # 2
A/V in
A/V in
cue audio
channel
cue aud
channel
Audio /
Video
D. A.
Program
Audio/Video in
VTR Interface
VTR Interface
Control
Signals
Switcher
Control
Tally Transmitter
Tally Signals
CONTROL LOGIC
Commands
Address Decoder /
Command Receiver

design of a new VTR interface module; the rest of the system remained unchanged. With an appropriate interface module, almost any type of VTR could be employed in a Teleprocessor.

The command receiver/address decoder module receives command and address signals from a dedicated telephone circuit from IHETS. These signals are translated into DC control pulses for the control logic module. The address decoding capability allows any number of Teleprocessors to share a multi-drop or party-line control circuit without interference, which can substantially reduce the cost of the control circuits on large systems. The control format employed by IHETS consists of a series of three audio tones, each tone being one of eight distinct frequencies. The first two tones are for addressing; thus, we can uniquely address up to 64 Teleprocessors with this format. The third tone indicates the type of command.

Again, the modular format allows a relatively painless transition to a new type of control by simply replacing the command receiver module. An appropriate module could control a Teleprocessor via connection to a modem and data link, a separate hard-wired controller, direct connection to a microprocessor, or a simple set of push-buttons for direct local control.

The tally transmitter module interfaces with the transmit side of the control link and translates the status signals from the control logic module into a form suitable for transmission over the control circuit. We are presently employing a system which uses Touch-Tone^{tm} signalling to transmit the tally information. The tally transmitter module may be wired to transmit continuously or to transmit in a "polled" mode whereby the tones are only transmitted upon receipt of a polling command from the central controller. This latter configuration is the counterpart of the address decoder in the receive section in allowing several Teleprocessors to share a common tally circuit.

The control logic module links together all system components and contains the logic necessary to supervise the operation of the VTRs in the selected mode. Circuitry in this module generates and detects special control tones on the cue audio track, controls the audio/video switcher, and translates machine status signals into system tally signals for the tally transmitter. In addition, the control logic module contains the logic for controlling the transition between VTRs when recording or playing back a program which is longer than one hour.

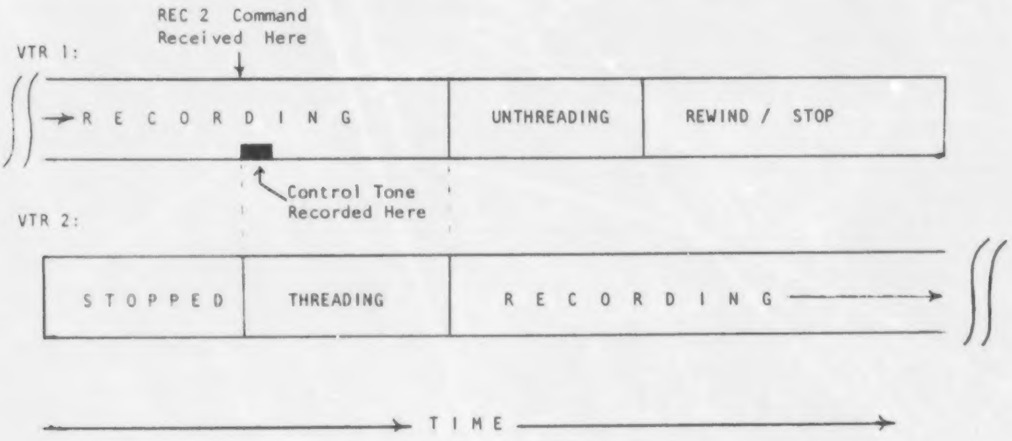
Command Summary

There are five machine control commands to which the Teleprocessors will respond. The PLAY 1 command causes VTR 1 to enter a play mode; then, if VTR 2 is running, it is stopped and rewound. The PLAY 2 command operates in an identical fashion for VTR 2. The play commands are only functional if the indicated VTR is stopped prior to issuance of the command.

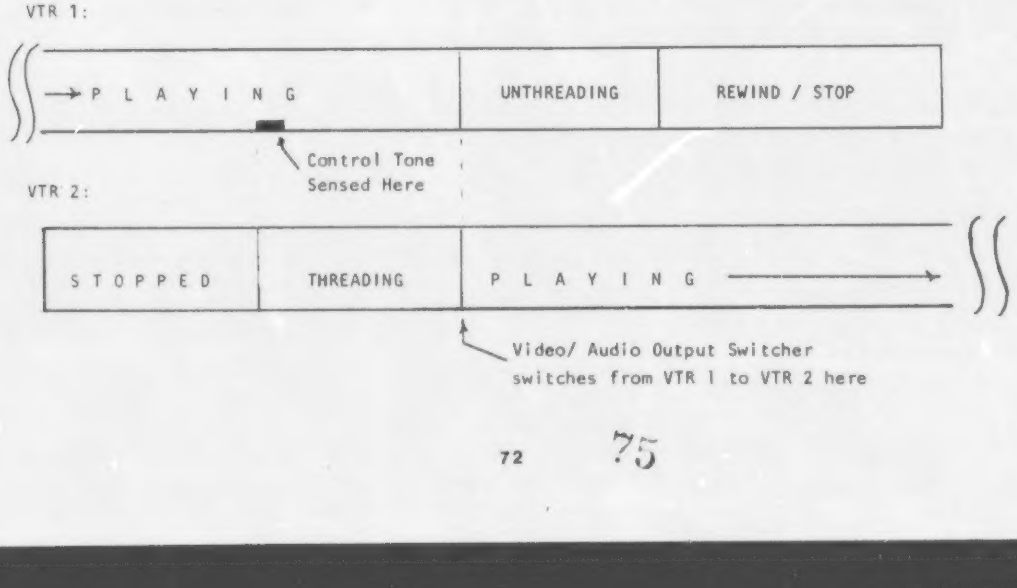
The RECORD 1 command starts VTR 1 in record mode; then, if VTR 2 is running, it is stopped and rewound. The RECORD 2 command operates in a slightly different manner in order to allow a continuous recording of more than one hour. VTR 2 is started in record mode; at the same time, if VTR 1 is in record, a special control tone is recorded on the cue audio track of VTR 1; then it is stopped and rewound. This control tone, when detected on a subsequent playback of VTR 1, will start VTR 2 in play mode just as if a PLAY 2 command had been received. In this manner, the changeover process which occurred during the recording is duplicated at the same point during the playback so that the viewer sees no discon-

FIGURE 3

CHANGEOVER CYCLE- RECORDING


REC 2 Command Received Here
VTR 1:
RECORDING
UNTHREADING
REWIND / STOP
Control Tone Recorded Here
VTR 2:
STOPPED
THREADING
RECORDING
TIME

CHANGEOVER CYCLE- PLAYBACK


VTR 1:
PLAYING
UNTHREADING
REWIND / STOP
Control Tone Sensed Here
VTR 2:
STOPPED
THREADING
PLAYING
Video/ Audio Output Switcher switches from VTR 1 to VTR 2 here

tinuity in the program during the transition between VTRs. Since the VTRs are not sync-locked to each other, a brief roll may occur in the video at this point, although this has not been found to be objectionable in practice. FIGURE 3 is a timing diagram that illustrates the series of events which occurs during the changeover process.

The final machine control command is STOP, which causes whichever machine is running to stop and rewind. Since only one VTR may be in operation at any given time, only one STOP command is required. In the case of a STOP command received during a recording, the VTR shutdown is delayed momentarily while a special control tone is recorded on the cue audio track. On the subsequent playback the detection of this tone serves as a signal to the logic to stop the machine at that point so as not to continue playing past the end of valid program material. Note that the STOP command causes the VTR to unthread, then forces a rewind to the head of the tape. Only when it has reached the beginning of the cassette will the machine actually stop. This means that all programs begin at the start of the tape and that any time a machine is stopped we are assured that the tape is fully rewound. Consequently, there is no need to perform a fast-forward operation at any time.

Although the capability of starting a recording at any point on the tape would provide additional flexibility, multiple recordings on a single tape for example, the lack of a practical scheme for "searching" out and cueing a particular program makes this approach impractical. We feel that the design which we have chosen provides a good compromise between hardware simplicity and operating flexibility and possesses sufficient intelligence to be operated by manual or automatic control.

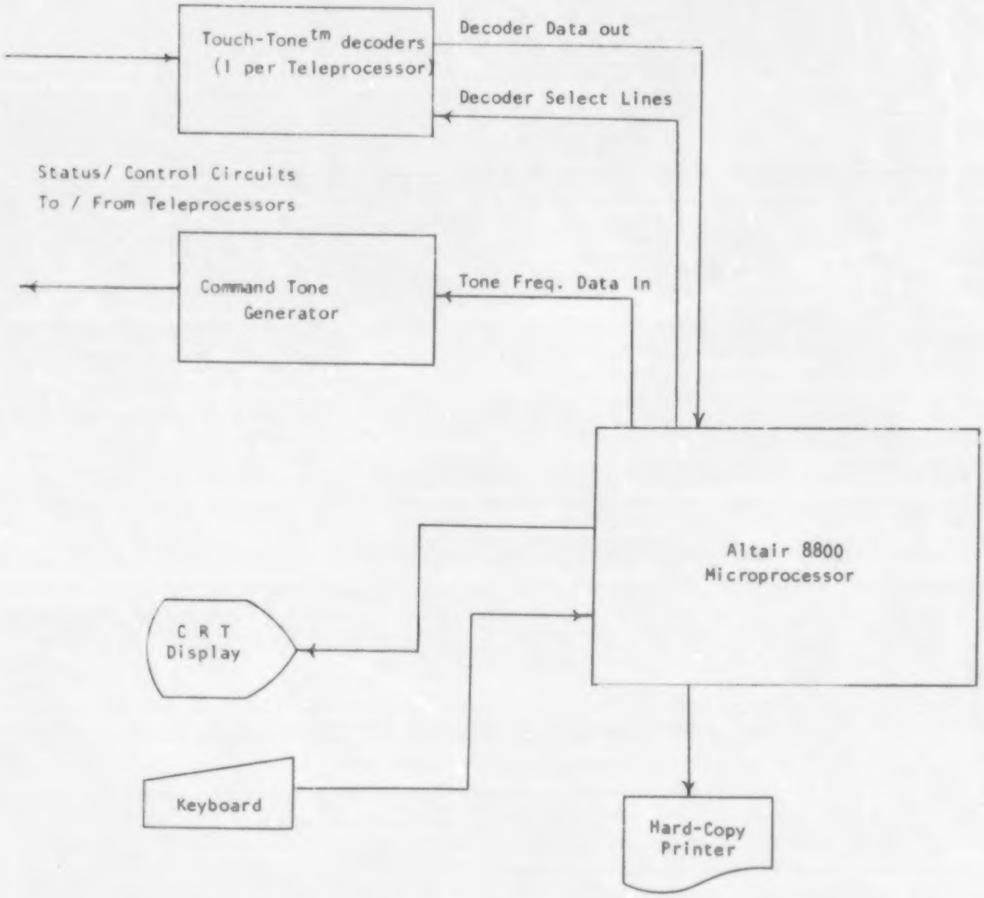
Central Control Facility

Control of all Teleprocessors in the system is handled by a microcomputer located at IHETS in Indianapolis. In addition, a manual control and status panel is kept on-line to serve as a back-up in the event of a malfunction of the primary controller. FIGURE 4 is a block diagram of the control system.

The computer interface to the Teleprocessing

FIGURE 4

CENTRAL CONTROL SYSTEM: BLOCK DIAGRAM



control circuits by means of a bank of Touch-Tone^{tm} decoders on the incoming side and by a command tone generator on the outgoing side. In our particular installation we are using a separate tone decoder for each Teleprocessor; this is necessary because certain elements of the control system are shared with the Teleresponse (talkback) system. Without this complication it would be possible to handle all Teleprocessors with a single tone decoder, using the polled tally scheme discussed earlier.

Other control system components include a CRT display system and keyboard to facilitate operator interaction and a hard-copy printer which is kept on-line to provide a permanent record of system operation.

The operator enters Teleprocessing requests via the keyboard. Each entry consists of Date, Time, Function (PLAY 1, REC 2, STOP, etc.), and a list of the location(s) where the function is to be performed. The computer maintains a queue of these entries, in chronological order by execution time, and the operator may request a display of the current contents of the command queue at any time.

A real-time clock attached to the microprocessor enables the time-keeping routine to calculate the current date and time of day. This information is always displayed on the CRT; in addition, the control program continuously compares the current time/date information with the time/date information fields in the next queue entry. When this information matches, the computer executes a program which causes the command generator to transmit the proper series of address and command tones to the desired location(s). Simultaneously, the program monitors the incoming tally signals to verify that the Teleprocessor has responded properly. An audible alarm signal alerts the operator if a Teleprocessor should fail to respond properly to a command.

FIGURE 5 represents a typical display of the command queue, with comments to identify the various fields. In addition to this display, the operator may request a display of the current tally signals from all Teleprocessors as well as the status of the tally circuit itself. If no tone, or an illegal tone combination, is being received, the display will alert the operator to that condition.

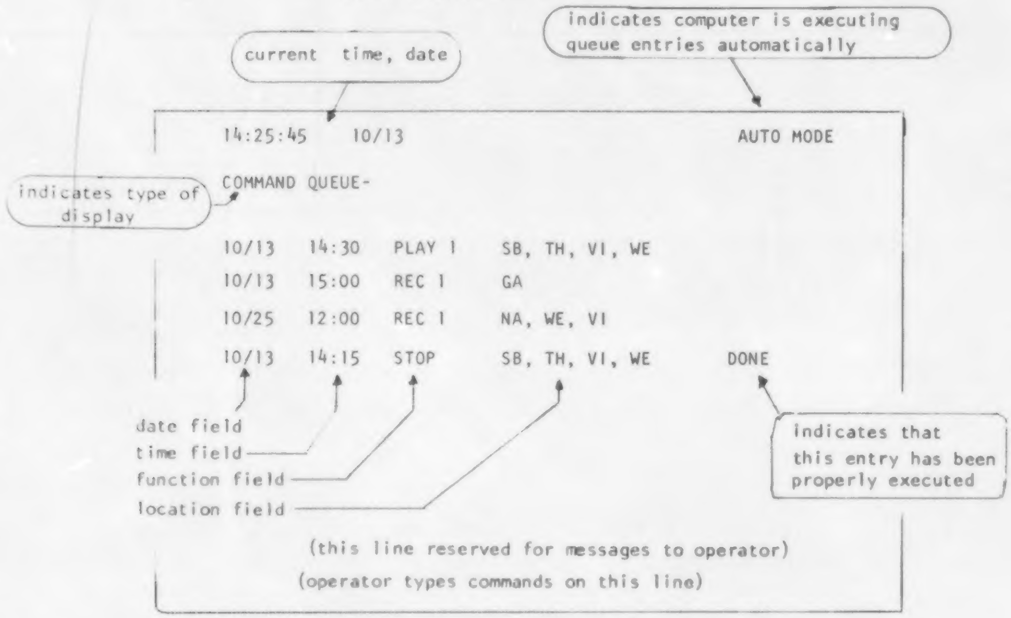
Additional keyboard commands allow the operator to delete or modify queue entries, enable or disable automatic control, reset system time or date, manually control any Teleprocessor, and enter a self-test routine whereby the microprocessor verifies the integrity of the control program operation.

System Software

The main system control program is written in BASIC. A high-level language was selected to reduce the time required for the programming effort. The prices paid for this time-saving are increased memory requirements and a corresponding increase in program execution time. The latter consideration was not significant for the majority of the control functions, but certain time-critical routines (such as time-keeping, tone generation timing, and decoder scanning) had to be coded in assembly language for maximum execution speed.

FIGURE 5

COMMAND QUEUE DISPLAY



```
14:25:45   10/13                                  AUTO MODE

COMMAND QUEUE-

10/13   14:30   PLAY 1   SB, TH, VI, WE
10/13   15:00   REC 1    GA
10/25   12:00   REC 1    NA, WE, VI
10/13   14:15   STOP     SB, TH, VI, WE          DONE

           (this line reserved for messages to operator)
          (operator types commands on this line)
```

current time, date
indicates computer is executing queue entries automatically
indicates type of display
date field
time field
function field
location field
indicates that this entry has been properly executed

The computer sorts the queue entries chronologically and displays them in order of execution time, with the exception of entries which have already been executed- these are shifted to the bottom of the list.

The BASIC software is linked to the assembly-language subroutines and handles such tasks as generating, sorting, and maintaining the command queue; generating and updating the displays; and interpreting and processing keyboard input.

The combination of high-level language and assembly language programming has produced a software system which is quite flexible and easily modified, yet which meets all speed requirements of the system. The Teleprocessing control software, in fact, requires only about half of the available CPU time for execution; thus, the system has the capability of running other tasks concurrently. At the present time, for example, the same microprocessor controls the Teleresponse (talkback) system and an intercity hard-copy message network. A side benefit of having all of these functions performed by a single machine is that the same operator interaction system (CRT and keyboard) can be used to monitor and control all systems, thus minimizing the duplication of hardware that would occur if separate control systems were used.

In addition, the microprocessor hardware, existing peripheral devices, and BASIC software provide a backbone system which allows us to implement new microprocessor-controlled tasks at very little cost.

The Future of Teleprocessing

Our success with the Teleprocessing system to date has convinced us that the approach is a sound one. IHETS is currently applying for a grant from the National Science Foundation for the design and construction of the next generation of Teleprocessing, which we call Tele-Library. The Tele-Library concept envisions a system of multiple cassette record/playback decks--perhaps as many as six--with full random access via a mechanical tape-loader to a large library of videocassettes. Users at remote sites could call out a display of the programs currently available at a particular Tele-Library unit, schedule tape playbacks, enter requests for new programs to be recorded, etc. An internal microprocessor would maintain a table of scheduled playbacks, check for scheduling conflicts, update the library display as new programs are acquired or old ones deleted, and communicate with a central control computer to coordinate the recording of new programs and to forward program requests and messages.

Summary

IHETS presently has Teleprocessors installed at twelve locations throughout Indiana, and in the three years of their existence these Teleprocessors have served to store several hundred hours of program material. We feel that our original design goals have been achieved and that Teleprocessing is a viable alternative to the addition of new network channels.

Teleresponse

Teleresponse is a computer-controlled, one-way, voice talkback system used in conjunction with live instructional programming on the IHETS Video Network; it allows instantaneous direct voice communication between viewers at a receive location and personnel at the originating studio. Teleresponse was designed and implemented by the IHETS staff as a replacement for an earlier system which employed electro-mechanical dialers to communicate over the standard switched telephone network. The old system had several disadvantages: audio quality was often poor, response time was long (typically 15 seconds from the time the push-to-talk switch was depressed until the connection was completed), the equipment was quite bulky and not easily portable, and acoustical feedback often occurred when the talkback unit handset was near the program loudspeaker.

Design Objectives

During the design phase of the Teleresponse project, we placed a great deal of emphasis on simplicity of operation for the classroom user. We feel that talkback can be an extremely valuable tool in restoring much of the rapport between student and instructor which is easily lost when television is employed as an instructional tool. Technical problems such as poor audio quality, complicated operation, and long delays will quickly discourage use of the equipment. Consequently, these areas were studied closely.

System Description

To maximize audio quality and minimize switching delays, Teleresponse employs dedicated, full-period, intercity telephone circuits for the transmission of voice and signalling information. Three main components make up the Teleresponse system: the portable classroom units which initiate the conversations, the master units at each of the campuses which control the classroom units, and the central controller which switches the incoming Teleresponse audio to the desired studio. These components are organized in a "hub and spoke" arrangement as shown in FIGURE 6.

Classroom Units

The portable classroom unit, diagrammed in FIGURE 7, serves as the students' link to the Teleresponse system. Although the system is limited to one-way voice transmission, we employ standard push-to-talk telephone handsets instead of a separate microphone. The telephone handset is familiar to everyone, whereas people are often intimidated by the presence of a microphone. In addition, a telephone handset is held in a consistent manner by each user, while a microphone produces inconsistent user techniques and, consequently, varying audio levels. Each classroom unit is equipped with two handsets on long cords so that they may be positioned anywhere in the room.

The classroom units receive their power over the control pair from the campus master unit; thus, there is no need for a separate power connection in the classroom. Installation is quick and easy, requiring only a single plug-in connection. A rotary switch on top of the classroom unit enables the user to select the studio with which he will communicate. This switch controls the frequency of an internal Touch-Tone^{tm} generator. The generator's output is briefly switched across the line at the beginning of the transmission. Circuitry in the unit controls the timing and switching of the tone signal and handset audio, which are coupled to the line by means of a standard telephone matching network.

The classroom unit also generates a muting signal whenever a Teleresponse conversation is in progress. This signal is used by external muting circuitry in the classroom to reduce the level of program audio driving the classroom speaker by about 12 db to eliminate the possibility of acoustical feedback. Since the system is intended to be used as a push-to-talk/release-to-listen configuration, this momentary reduction in level does not interfere with normal conversation.

Campus Master Unit

FIGURE 8 is a block diagram of a campus master unit, which serves to control and monitor its associated group of classroom units. The master unit converts the DC-signalling indicating on/off status from the classroom units into tone-signalling suitable for transmission over the telephone line to the central controller. This is achieved by a tone generator which generates a special tone combination (not available as a studio select tone) to indicate to the central controller that the system is not in use. Since this tone combination is continuously present on the line when Teleresponse is idle, it serves as a constant verification that the circuit is functioning.

The master unit provides power to all associated classroom units. When a classroom unit is activated by depressing the push-to-talk button, the DC current flow is sensed by the master unit, and that classroom unit is coupled to the telephone line. At this point, all other classroom units are locked out until the first unit releases the push-to-talk switch, which in turn causes the master unit to switch back to the off-tone generator, thus signalling the end of the conversation to the central controller.

Individual adjustments are provided on the master unit to compensate for level differences caused by varying loop resistances to the classrooms.

FIGURE 6

TELERESPONSE: SYSTEM CONFIGURATION

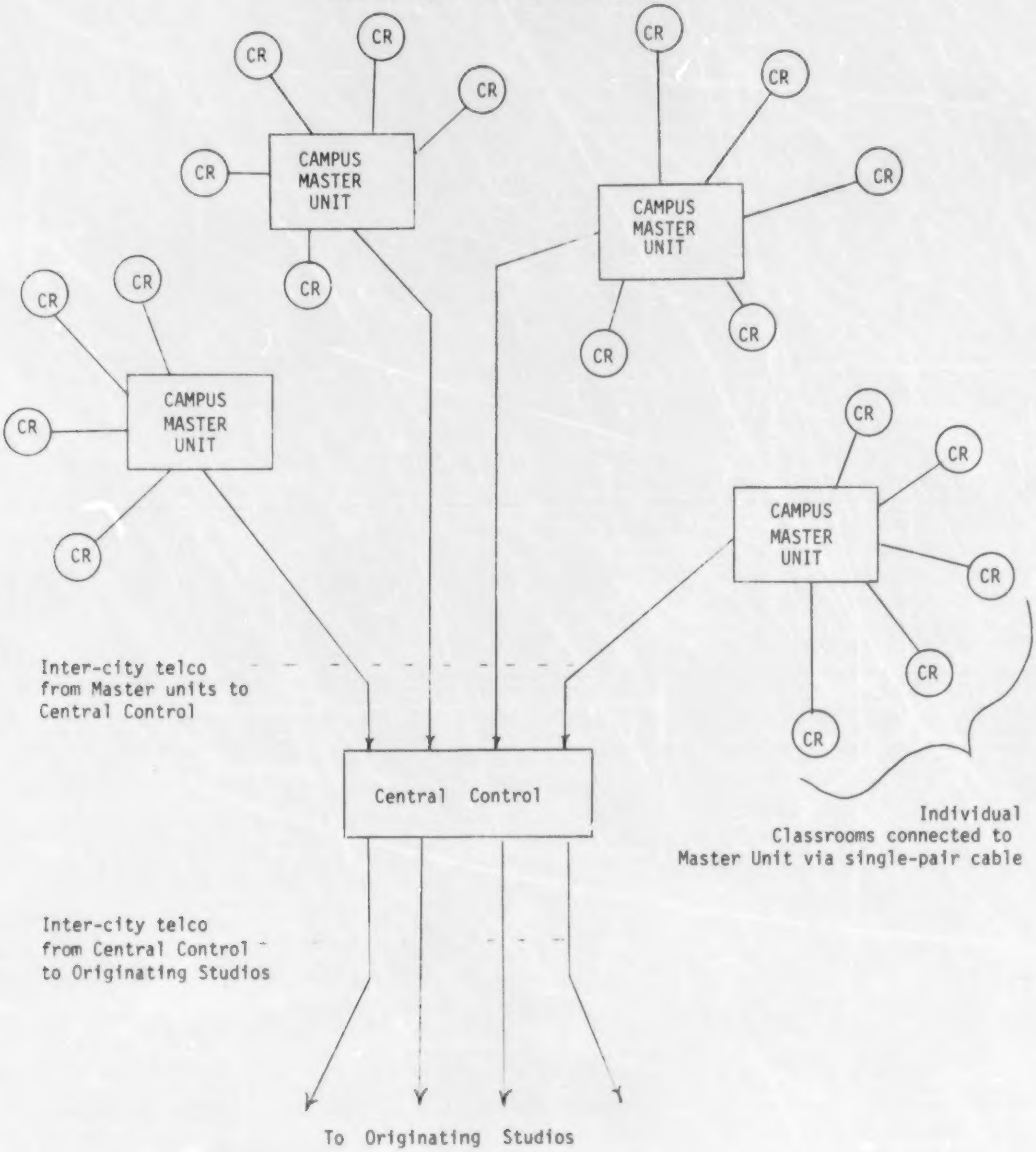
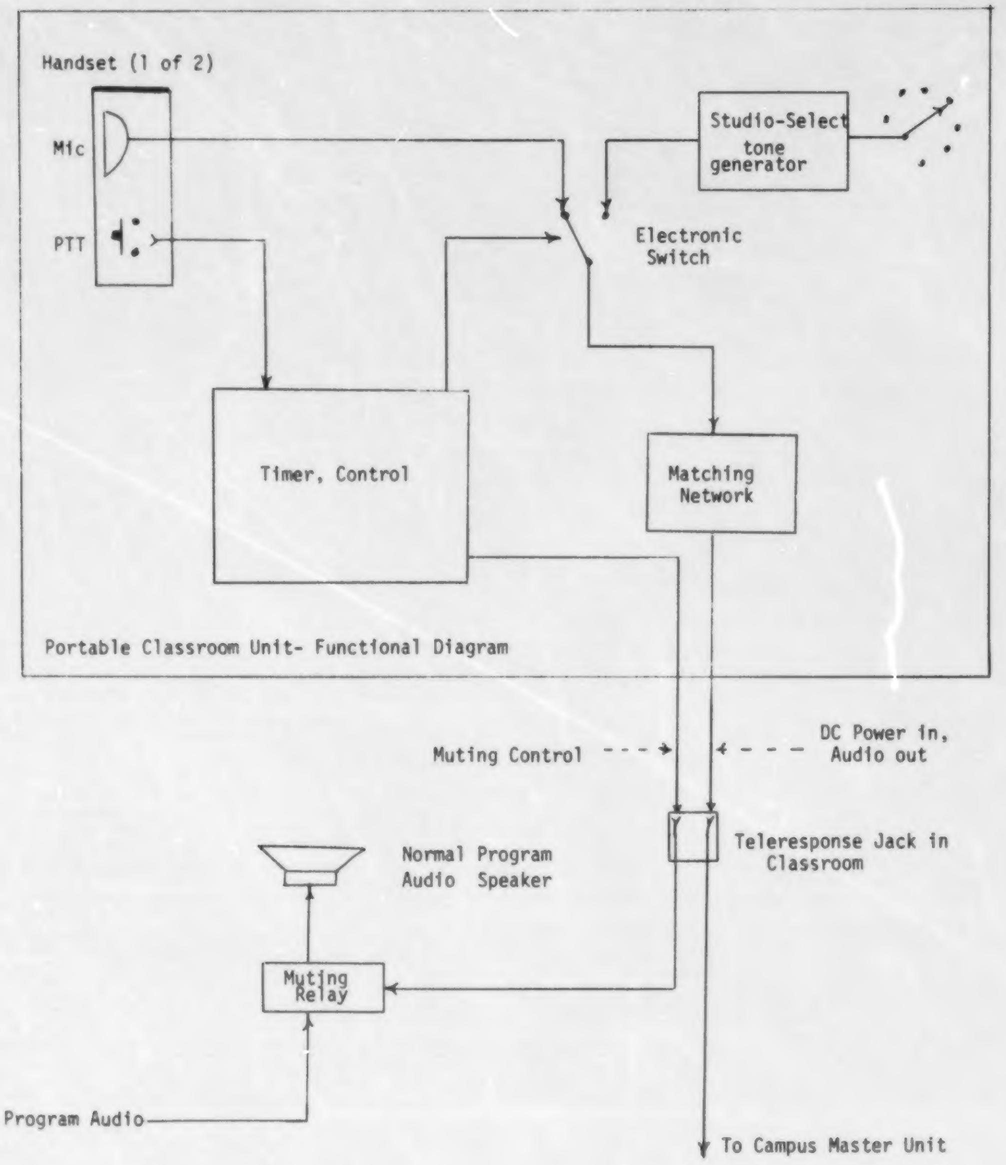

CR
CAMPUS MASTER UNIT
Inter-city telco from Master units to Central Control
Central Control
Individual Classrooms connected to Master Unit via single-pair cable
Inter-city telco from Central Control to Originating Studios
To Originating Studios

FIGURE 7


Handset (1 of 2)
Mic
PTT
Studio-Select tone generator
Electronic Switch
Timer, Control
Matching Network
Portable Classroom Unit- Functional Diagram
Muting Control
DC Power in, Audio out
Teleresponse Jack in Classroom
Normal Program Audio Speaker
Muting Relay
Program Audio
To Campus Master Unit

Central Control

The central control facility links the incoming telephone lines from the various Teleresponse-equipped campuses with similar lines to each of the originating studios. The controller is diagrammed in FIGURE 9. Each incoming line enters an amplifier, which in turn drives one input of the routing switcher and Touch-Tone^{tm} decoder. The tone decoders are sequentially scanned by a microprocessor to detect the off-tones and studio select tones from the master units and classroom units respectively. This information is translated into commands for the routing switcher. The actual switch closure is delayed until the end of the studio-select tone so that the tone itself is not sent to the studio.

Hardware/Software Consideration

At our particular installation the use of microprocessor control was dictated in part by the fact that much of the control circuitry for Teleresponse (microprocessor, tone decoders, phone lines) is shared with the Teleprocessing system. The presence of the microprocessor does, however, provide us with a high degree of intelligence in the controller that (1) allows for simpler hardware at other points in the system and (2) allows us easily to expand the system to accommodate special features.

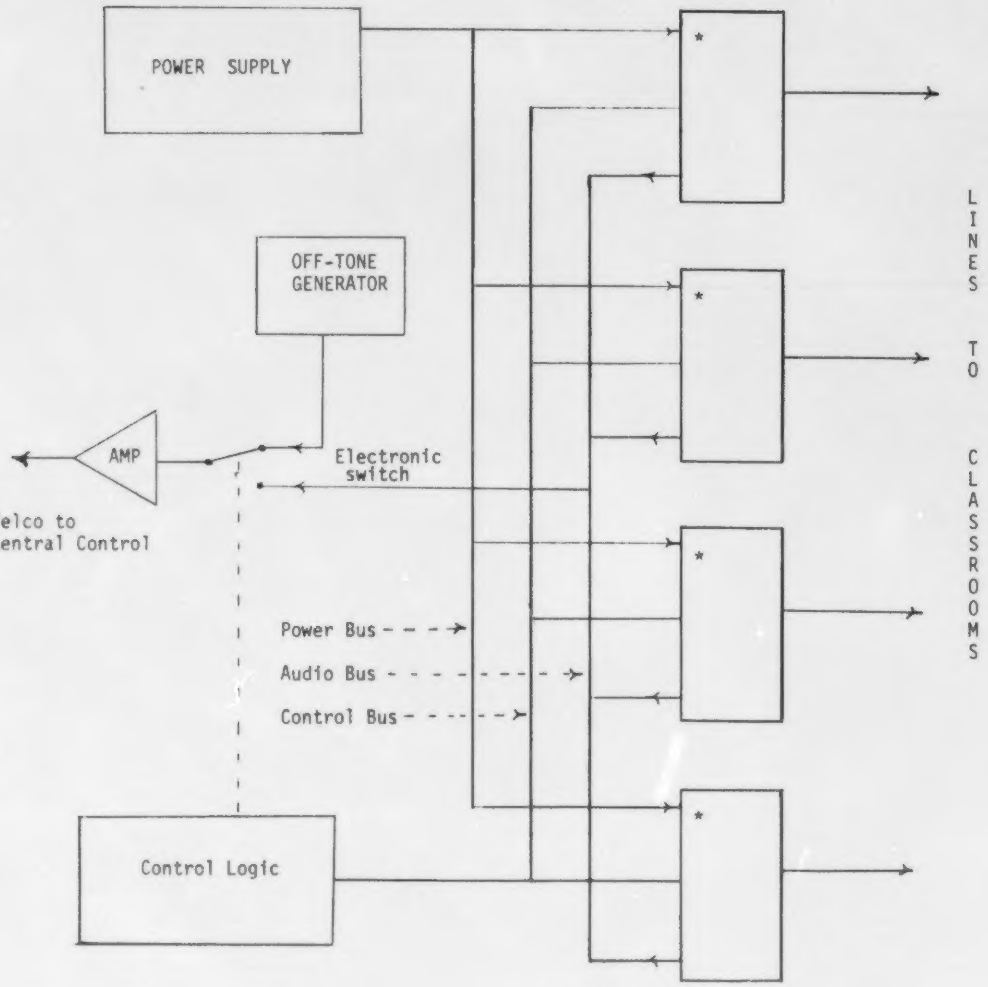
One area of hardware minimization achieved as a result of the microprocessor was the Touch-Tone^{tm} decoder modules, which the IHETS staff designed specifically for this project because commercially available units were bulky, expensive, and not directly compatible with our interface. Our own design uses low-cost phase-locked-loop integrated circuits as tone detectors with no bandpass filtering whatsoever. The elimination of the filters greatly reduces the size, complexity, and cost of our decoders, though it does make them more susceptible to false triggering. Consequently, we employ software "filtering" by requiring a stable decoder output for a fixed number of successive scans before it is accepted as valid. This has proven very effective and has resulted in an overall cost-saving.

Conclusion

Performance of the Teleresponse system has been as expected, and we feel that our design goals were met successfully. Most significant are the reduction of system delay by a factor of 50 (from 15-plus seconds to about 1/3 second) and the improvement of audio quality, in terms of both S/N ratio and elimination of feedback.

FIGURE 8

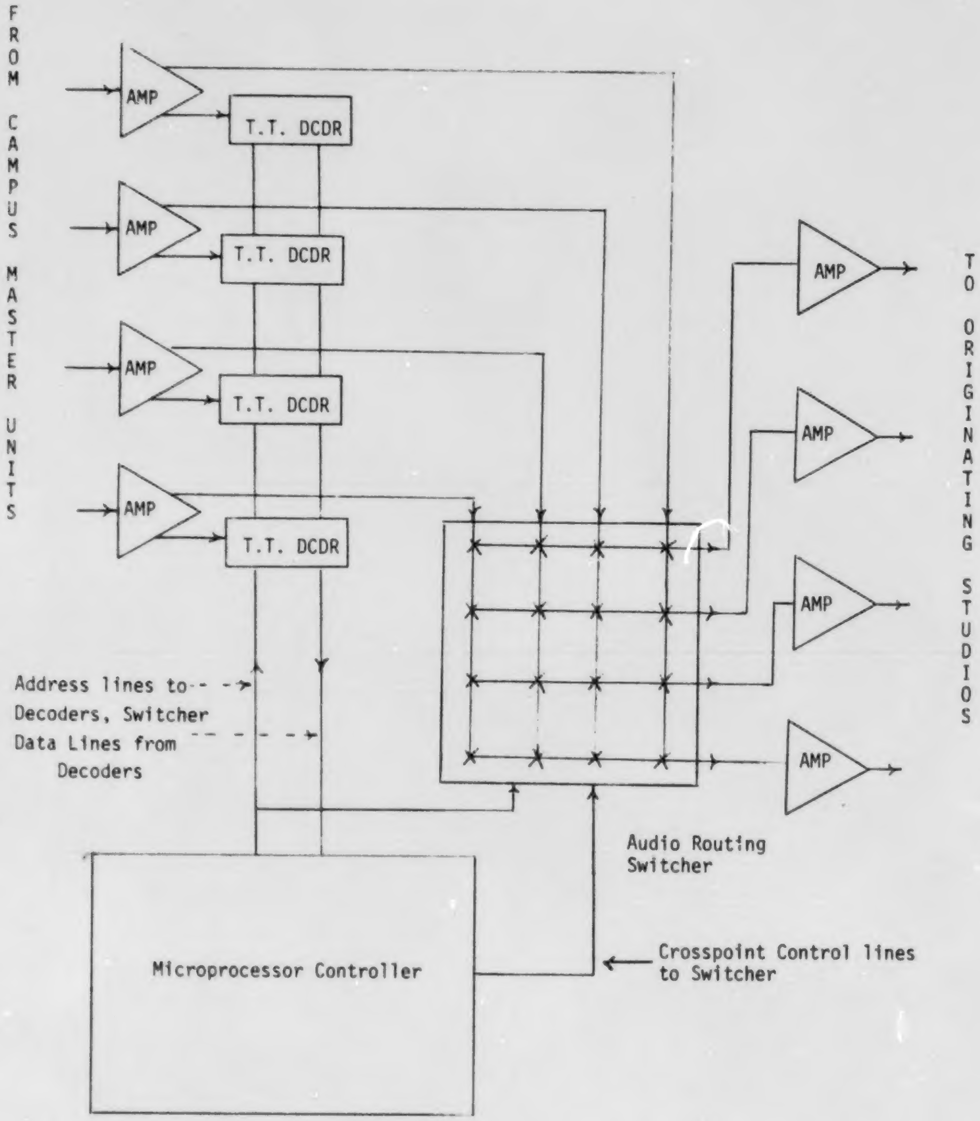
CAMPUS MASTER UNIT: BLOCK DIAGRAM


POWER SUPPLY
OFF-TONE GENERATOR
AMP
Electronic switch
Telco to Central Control
Power Bus
Audio Bus
Control Bus
Control Logic
*
*
*
*
LINES TO CLASSROOMS

*Line Switch and Control

FIGURE 9

CENTRAL CONTROL: BLOCK DIAGRAM


FROM CAMPUS MASTER UNITS
AMP
T.T. DCDR
AMP
T.T. DCDR
AMP
T.T. DCDR
AMP
T.T. DCDR
TO ORIGINATING STUDIOS
AMP
AMP
AMP
AMP
Address lines to Decoders, Switcher
Data Lines from Decoders
Audio Routing Switcher
Microprocessor Controller
Crosspoint Control lines to Switcher

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THE EDUCATIONAL TELEPHONE SYSTEM AND AGRICULTURAL EXTENSION PROGRAMS: A CASE STUDY

Norman R. "Sam" Swan
Information Specialist
University of Missouri

Introduction

The University of Missouri-Columbia has been actively involved in educational program delivery via the Educational Telephone System (ETS) for eight years. During that time-span, faculty members from the College of Agriculture have been the system' most prolific users.

Missouri is divided into twenty-one distinct program planning units called Extension Areas. Each area is administered by an Area Director who is then responsible to the Vice-President of Extension for the total University-wide system.

Each of the areas is staffed with professional Extension specialists who have an area-wide responsibility for all Extension livestock programs in his multi-county extension area.

The Educational Telephone System in Missouri is administered through the cooperation of Area Extension Programs. Area continuing education (CE) specialists are responsible for all off-campus credit and non-credit programs in addition to ETS programs. ETS units are located in each of the areas of the state and are moved by CE specialists when necessary.

Three programs emanating from College of Agriculture faculty are discussed here: 1. Horsemanship Seminars, 2. Agricultural Economics Outlook Conference, and 3. Agricultural Economics Breakfast Seminars.

Horsemanship Seminars

In 1972, Dr. Melvin Bradley, State Extension Specialist for Horses was commissioned by the National 4-H Service Committee to prepare a series of educational slide-tape presentations for use with 4-H Horsemanship groups throughout the country. Over the next several years, many were produced in the office of Extension Information at UMC. The slide-tape presentations were distributed to Extension Youth Specialists in Missouri who organized special meetings with horsemanship leaders and members.

In an effort to maximize the effectiveness of the slide-tape presentations, the Educational Telephone System was employed so that questions could be asked from viewers throughout the state. The twenty Extension Areas in Missouri were interconnected with the ETS five different nights. A different slide-tape presentation was shown each evening, and a different horsemanship authority was the quest on the ETS each evening.

More than 1500 horsemanship members and leaders participated in the slide-tape ETS program and the overall rating was excellent.

Quarterly Agricultural Economics Outlook Conferences

An effective example of the ETS and its uses in Agriculture is being conducted by the Extension faculty of the Department of Agriculture Economics. Two to three Agricultural Economists examine the current markets with regard to livestock, grain, dairy and poultry.

The economists present an hour of general discussion of market trends and outlooks. An hour of questioning follows. Five or six Missouri Extension Areas are interconnected each evening and participate in the question-answer sessions. The program is conducted four consecutive evenings in order to reach each of the areas in the state. Area Farm Management Specialists conduct the on-site meetings for county and area farmers. Farmers, businessmen, bankers, and others interested in market trends in agriculture are invited to participate.

Evaluations of past programs have suggested above-average participation among program participants. An average of 800 farmers participate in the quarterly meetings. Results of the evaluations clearly support the belief that the ETS is an effective teaching technique and delivery system for agriculture extension programs. More than 90% of the farmers who responded to the evaluation questionnaire reported that the meetings were informative and unique opportunities to discuss market trends with experts.

The Department of Agricultural Economics reports they will continue to use the ETS for program delivery.

Breakfast Seminars

In the Winter of 1976-77 members of the Agricultural Economics faculty elected to use the ETS to reach a special audience--young farmers. A special need for various kinds of economic information was determined to be most needed among Missouri young farmers.

Two locations in west central Missouri were identified as pilot areas for an ETS program for young farmers. Farm Management specialist Norlin Hein began coordinating the program in cooperation with area farm management specialists.

The ETS program was presented at 7:30 a.m. to 8:30 a.m. on Wednesday mornings to two locations. Fifteen to twenty farmers participated at both locations.

The program format called for Agricultural Economists and special guests to discuss requested topics suggested by the farmers. Topics have included tax preparation and computation, property title problems, record-keeping, estate taxes, and management. Discussions were held the first half-hour, followed by questions from the participants.

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The program was received with enthusiasm from the participants in the pilot area, and plans call for a state-wide effort next winter.

Costs

Costs for the UMC Educational Telephone System are minimal. The conference bridge and WATS line access costs a total of $830 per month; this cost is incurred by the Extension Division. All conferences are now utilizing WATS use and no additional line charges are being incurred.

A technician is employed to run the conference bridge during conferences. Extension pays him a total of $2.87 per hour. The only charge made to Extension users of the system is the costs for DDD lines when necessary. The philosophy here is to provide the ETS to Extension users at a very inexpensive and efficient rate.

Conclusion

The Educational Telephone System in Missouri continues to be an important part of the Extension program efforts of the College of Agriculture.

In an era of constraints on financing, the ETS is expected to increase in usage. A cost comparison between the UMC ETS and actual travel is revealing. The cost of the ETS is virtually nothing for participating departments. WATS lines are used for evening programs and Extension absorbs technical costs. Charges are made only for line charges during daytime hours.

Increased usage of the ETS for agricultural programs seems imperative.

TELECONFERENCING IN EXTENSION---AN AGRICULTURAL ECONOMICS PERSPECTIVE

Edwin W. Vernon, Ed D
Instructional Media Specialist
University of Illinois, CES

Time: 7:30 p.m., December 9. 1976
Place: TeleNet room, Mumford Hall, University of Illinois, Urbana
Event: Beef Cattle Feeder Update

From the transcript of the program: "For our program a little later we will be calling Bob Daugherty. Bob is livestock marketing specialist at Oklahoma State. Bob will bring us up to date on the cattle situation in Oklahoma: the occurance and movement of cattle, the feed and wheat situation. After we visit with Bob, we'll get on with Bruce Ginn of Denver. Bruce is in charge of the Western Livestock Roundup. Then we'll ask Burt Weichenthal (Illinois livestock specialist) to comment on the total situation, especially what the movement is in Illinois. Burt is here with me. He'll comment on the feeder cattle sale over at Peoria last Friday. Then we'll go on over to Kansas and talk with Lee Throckmorton, Kansas Livestock Company order-buyer.............

"First, let's hear from Burt with a rundown of the Peoria sale. Burt, this was a hot sale over at Peoria last Friday afternoon. Right, Brice. They sold over 1500 head, a record number for that sale. Going down the list here, they had some special cases completely conditioned and certified by a veterinarian, that helped a bit. Twenty-one Charolais, weighing 498, went for $45. Here's twenty-three black cattle that weighed 468 that went for $43...................... Going on down the list, almost all the cattle that weighed 400 pounds or more sold for over $40. If they were preconditioned, they brought a bit more, and if they were certified, they also brought a bit more. Steers brought more than heifers by $7 to $10 a hundred.................Well, Bruce, that gives a pretty good sampling of what we had over at Peoria.

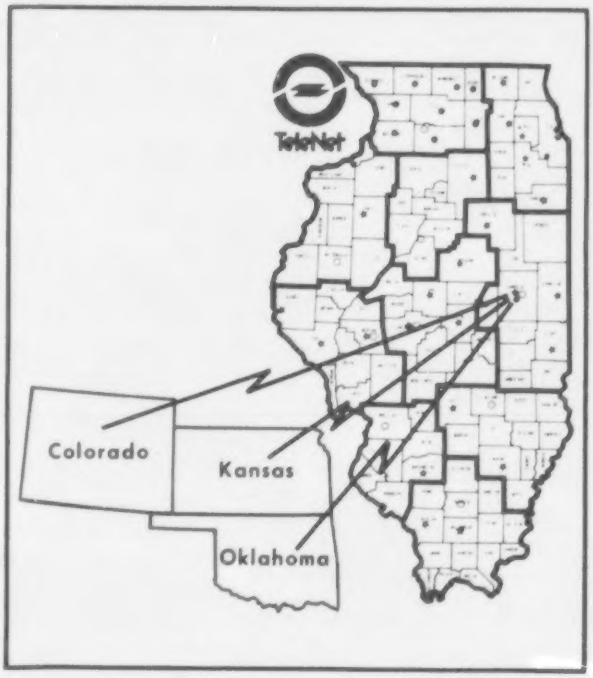
"That was quite a bit stronger than the Shelbyville sale, wasn't it? Right, it was $2 to $3 stronger. OK, Burt, thank you. Ed, if you'll make the first call we'll take questions from the field while the call is being put on..................

"OK, fellows, we now have Bob Daugherty from Oklahoma State on the line. Bob is ready to give us a rundown on the situation. We'll turn it over to him for a rundown on the situation and then open it up for questions.

"Good, I'll appreciate the questions.............

"Now, Brice, I'm not sure what I've left out. OK, Bob, what about feed: are they moving any wheat into the rations now? Yes, when I talked with this group last there was very little movement of wheat into the feed, but the corn-wheat price situation has shifted, and there is considerable wheat being moved into the rations...................."

Thus, Extension agricultural economists in Illinois and Oklahoma, along with an order-buyer from Kansas City, and a livestock specialist from Illinois, provided first hand information on the feeder cattle situation for sixteen groups of Illinois cattle feeders. These men, each on top of the factors affecting the cattle situation in different parts of the country, shared with sixteen groups of cattle feeders, each group in its own county. These specialists were on top of current prices, availability of feeder cattle, the feed-grain and hay situation, all important factors in the feeder cattle situation. Each of these contributers brought to the farmers of Illinois a different geographic and professional perspective. They provided a competence based on local experiences and current observations tempered by their respective professional backgrounds.



This raises other important questions, e.g., costs versus benefits, alternative approaches and relative costs, where this program fits in the total Extension job, where TeleNet fits in the marketing/prices/outlook educational job to be done?

Let's look at the Illinois marketing/prices/outlook program. The Illinois Agricultural Economics marketing/prices/outlook program has charged a task force with eight duties and responsibilities. These duties and responsibilities are to:
--produce fifty issues per year of the newsletter, "Illinois Farm and Food Outlook."
--during August and September, present a series of county and multi-county outlook meetings.
--schedule topics, coordinate and write material for

Prairie Farmer special outlook issue (October), follow up with winter updates, and prepare weekly radio tapes and news stories.
--participate, via the Extension Service's statewide TeleNet system, in regular monthly price and outlook updates and special updates on feeder cattle, soybeans and oil seeds, wheat and feed grains.
--write and handle publication of Illinois Outlook News.
--respond to phone calls, letters, and other inquiries relative to prices and outlook.
--participate in midwest and national outlook conferences and in ES-USDA Computerized Management Newtwork (VPI and others) for outlook information.
--prepare an outlook series for special groups such as county grain dealers and livestock marketing associations.

The Agricultural Economics department uses TeleNet to provide marketing information with two different emphases to three different audiences. The marketing emphasis is either grain or livestock. TeleNet consists largely of programs for specialized audiences identified by the county advisers (agents).

These audiences include the county Extension staff. In Illinois, advisers with special interest in agricultural economics are given additional training to increase their competency. These advisers are singled out as a special target audience for some of the TeleNet marketing series. A second identified audience is farmers specializing in finishing beef for the meat trade. This audience was the target for the program that leads off this paper. A third audience includes bank farm loan officers, grain elevator operators, farm managers and other agribusinessmen. For this audience the specialists provide an immediate analysis of the affect of current economic data, e.g., Crop Reporting Board reports such as "Crop Production", "Grain Stocks" and "Cattle on Feed" reports, from the Statistical Reporting Service of the USDA. For example, on January 21, 1977, "Prospective Plantings" was released at 2:00 p.m. The Agricultural Economics marketing team of specialists held two TeleNet programs on that day. The afternoon session was timed to be in progress as the "Prospective Plantings" report came over the wire. This timing added an element of expectation, immediacy of information, and the immediate reaction of the marketing specialists. This was a valuable program to this agribusiness audience, since the figures released were surprisingly low. However, in the evening program, the importance of the selection of the date became evident as the marketing specialists had used the intervening hours to analyze the situation and project the effect to the market.

On November 16, the team took a different approach. One member was in Washington, D.C., attending the National Outlook Conference. By dial-up phone we patched our Washington team member into TeleNet, received and responded to his direct report from Washington. The on-campus team, augmented by an IAA marketing management specialist, provided instant analyses of the situation for the twenty-six different groups of Extension clientele gathered for the program.

This program format differed from the January 21 program in that the teaching team was located in three cities, two in Illinois via TeleNet and one in Washington, D.C., brought to the audience via direct dial patched into the dedicated TeleNet lines.

We've looked briefly at a couple of programs. Let's examine the TeleNet configuration, the technique, and a bit of the communication psychology evident in delivery of these programs.

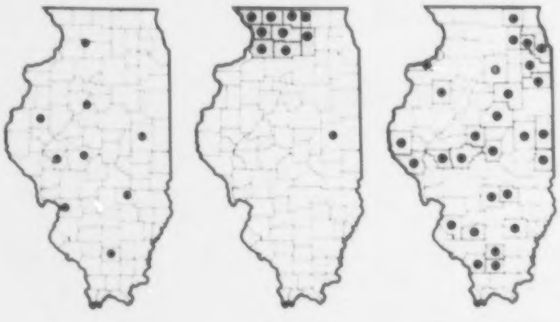
Illinois TeleNet is a 48 station dedicated telephone network. Most of the stations are located in county Cooperative Extension Service offices; a few are in Extension Regional Directors' offices. Each of the stations is equipped with amplifying equipment. Standard telephone jacks are located in offices, board rooms and meeting rooms in each Extension complex.

Current Illinois TeleNet is three interconnected systems. A dedicated four-wire network connected to each of the eight existing regional offices, the director's office, and two other administrative offices. A second network connects all of the offices in Extension region one in the northwest corner of the state. These nine county offices and the regional director's office are interconnected and connected to the university TeleNet office.

Finally, a thirty-one station network connects other county Extension offices throughout the state. A switching arrangement allows these three networks to be separated or to be switched together either as one, two or three networks. Thus, region one can be connected to the general network while the regional office network is kept intact.

Since the pattern of dedicated TeleNet installations left several gaps resulting in inconvenience and excessive travel, we provided the opportunity for counties to install regular phone jacks and to use conference phones in the two-wire format for their programs. We keep a supply of two-wire units to mail to the users on demand.[1]

Illinois TeleNet



Regional Offices Region I General Network

> The volume of information between any two points justifies the cost of the link. It is the anticipation of heavy increases in information volume that justifies the investment in additional circuitry.[2]

Costs of land lines are associated with the number of uses; for, as volume increases, the number of lines per cable increase and the cost per line in the cable decreases. Large message volume communications routes such as the route from Springfield (state capitol) to Chicago (largest city), in Illinois, are laced with large numbers of cable pairs. Lower volume routes, such as occur in much of the state where there are few state or federal agencies, do not enjoy either the large cables with many pairs of phone wires nor the government contracts that result in lower per line costs. Configuration of our TeleNet reflects these pricing realities. Justification of staff support is also associated with such anticipated heavy use of a communications system. And conversely, staff support increases the use of the system.

Cost of the monthly rental of lines is only one of the problems associated with delivery of a comprehensive program via the TeleNet. The staff faces many issues which only slowly became evident to the Extension subject matter specialists.

When dealing with the technology, staff must be prepared to overcome inertal forces, for technology can be unsettling to existing institutions, whether these institutions be organizational or delivery in purpose. Introduction of technology forces us to reexamine our goals, purposes, philosphies, and methods. The greatest good that will come from the use of the phone in teaching in Illinois Extension may be that it forces us to examine what we communicate. Are we really serious about extending real education to all of the people of Illinois?

> Henry David Thoreau, on hearing that a magnetic telegraph was being constructed between Maine and Texas, asked, 'But Maine and Texas, it may be, have nothing to communicate?' Then there is the report of the committee long ago set up to assess the Gutenberg invention which solemnly concluded that there was no need for the printing press since so very few people could read.[3]

We must be continually alert that our response to technology isn't predicated on such attitudes. But it isn't only our attitude we must be cognizant of, but the attitudes of our audience. They must perceive benefits otherwise unavailable without the link.

> Students in teleteaching experiments have to perceive some definite and otherwise unattainable benefits from such communications links. That is, the system must serve them in some obvious way, generally, in terms of distant expertise that is made available, before such drastic compromise to a traditional teaching situation will be tolerated.[4]

To the communicator or specialist touting an Extension program in TeleNet this means he focuses on those factors, not always obvious, that make the program special. In our opening examples, we illustrated three special benefits of using TeleNet and remote teaching techniques. We bring to TeleNet audiences specific local expertise and on-the-spot observations. Secondly, we were able to bring to our TeleNet clientele not only a variety of talent not otherwise available, but we could tap the resources of a broad range of campus specialists and resident staff. Remember Burt Weichenthal in our first example? He is a livestock specialist used because of his special current knowledge of the Illinois feeder cattle marketing scene. The Extension marketing team provides instant analysis of the comments from those persons brought in by dial-up.

The primary benefit of TeleNet, its' uniqueness to this audience, is that it brings information to them. Imagine the massive logistical efforts to bring the regions specialists, the cattle buyer, and the audiences from sixteen counties to a single location. We are able to offer the specialists team and the out of state talent simultaneously, in each of forty-eight Illinois counties.

However, we are not delivering a perfect product. Don't forget that no two of us is operating from the same knowledge base; and that we do not each have the same understanding of terms and concepts.

Egocentricity--a common cultural phenomenon--language and background are interwoven. Each of us is egocentrically attached to our language; believe it to be the most important and most logical of all the language options. Egocentricity is frequently a potential limiting factor in the language of the agricultural economist. Uses of a language that may be foreign to some of our audience is common and adds to the potential for communications failures. A language familiar to the economist facilitates learning when it's internalized, but becomes yet another barrier to the communications process, and to the teaching-learning process, when it is poorly, partially, or inadequately understood.

Let's look at one example of a study of agricultural terms. From a Wisconsin study, farmers and homemakers were asked to define terms used on pesticide labels. On the term "fungicide," only thirty-two per cent of the farmers defined it correctly. Only forty-six per cent understood the term, "wettable powder," another familiar agricultural term. "Toxic," a common term, was understood by only sixty-six per cent of the farmers surveyed. Yet, when we teach or write for agricultural audiences, we assume they know these terms. Are we also guilty of assuming that our agricultural economics audiences are conversant with the language of the profession? Nearly all similar studies of communications patterns and levels of understanding of common words reveal similar results. This effect compounds the communications and understanding problems associated with remote teaching. It is not always easy, certainly not as easy as in a face to face situation, for the confused recipient of the word message to have his confusion cleared up. In the remote teaching situation, the mechanics of responding to the instructor preclude really effective discussion in large group situations unless special efforts are employed. The specialist must build into his instructional design really effective procedures for continually testing the level of understanding of his topic. So the role of the TeleNet communicator takes on an added dimension beyond those already complicating the role of any other communicator. An understanding of the necessity for this additional concern is a first step toward alleviating the problems. However, understanding that there may be a source of difficulty is generally slow to come. Subject matter specialists know their subject so thoroughly that they have difficulty comprehending this particular facet of remote teaching. And if they comprehend the difficulty, they are at a loss as to how to deal with it.

> It is understandable, if egocentric, of English speaking people to believe so earnestly in the importance and integrity of their language. But the sobering fact is that so few speak and write this language when compared with the millions who communicate in the many Asian tongues.[5]

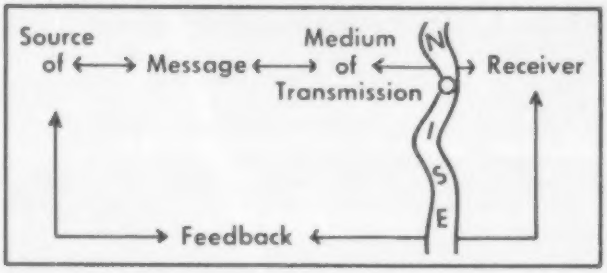
This principle is no less true of the agricultural economist trying to communicate in his own peculiar language with its diverse words, e.g., basis, margin, forward pricing.

> Even when language is indiginous, as in English, there are semantic roadblocks that make communication difficult between sections of the U. S. and even between the English speaking people.[6]

Semantic and syntactic difficulties are no less a factor in completion to any communications. Agricultural Economists using the TeleNet as a medium are constantly faced with language difficulties, and with the added necessity to interact with the medium. In normal, face to face, communications the elements of the process include the message, the medium and the receiver.

TeleNet, like any medium of communication, becomes the third element in the communications process. Elements one and two of the communications process, the sender and receiver, each interact with the third major element, the medium. Sender interaction with the medium starts with the pre-planning phases of the program. Audience identification, a continual part of the Extension specialists job, takes on increased importance with the TeleNet. Differences in background information and understanding of the terminology of the topic by the intended audience are two perhaps unexpected elements the specialist must consider.

This communications pattern--the message, the medium and the receiver-- is never the complete communications process. Add noise and feedback, thus the process becomes:



We've added the element noise. We've already discussed some of the elements of noise. There are many facets of noise including definition of words each participant in the process may have, vested interests of each party, and competing information sources and messages. External factors, such as the physical setting of the room, affect the process. If it's too warm, cold, dark, light or noisy, communication becomes difficult. Noise interfering with completion of the process includes the number of other stations on the line, the number and availability of mics for feedback, shyness of the audience member and patience of the message sender.

There are adjustments the specialist must make in TeleNetting. Obviously some adjustments must be made in interactions between the specialist and the medium, thus to the audience. He provides additional hooks and cues to learning. Among these cues provided by the Agricultural Economics specialist are statistical information provided in both written and overhead projection form. He provides partially completed forms so they can write in statistics, thus keeping the audience involved in the learning process. He encourages the audience members to keep a notebook if the program is a part of a series of marketing updates. During the programs, the specialist frequently assists the audience's leader, usually the county adviser, in keeping the proper pace, by reiterating the item being discussed on the form or visual. He gives elaborate verbal cues that keep the audience members on the same wavelength with the specialist and with each other.

Cooperative Extension in Illinois has an operating philosophy which is predicated on local programming autonomy. Therefore, acceptance or non-acceptance of marketing/outlook/update TeleNet is an option available to each adviser. Acceptance of program concepts, working with local Extension councils with the purpose of generating interest in TeleNet marketing, in some cases obtaining financial, as well as psychological support for the program, are all preliminary steps to local TeleNet programming. Then the adviser must take the necessary steps to integrate TeleNet offerings into local Extension programming. Among these overt-positive steps is identification of an appropriate audience, designing and implementing an information plan to inform and encourage this audience to participate in the TeleNet session.

Program boycott by the county Extension staff is one of the most effective feedback mechanisms employed by advisers to let specialists and departmental leadership know that a particular program series need not be continued or repeated. Specialists adjust their offerings based on interest of advisers. Thus, at least four dimensions of interest are discernable. Efforts to generate a local audience, continued signup and attendance of advisors for marketing programs, intensity of participation during the programs, and written reports of audience attendance along with comments are all indicators of satisfaction with the Agricultural Economics marketing programs.

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ADAPTABILITY OF TELELECTURE PROGRAMS TO AUDIO CASSETTE COURSES: A CASE STUDY IN PHARMACY

James E. De Muth, Ph.D.
Extension Services in Pharmacy
Health Sciences Unit
University of Wisconsin-Extension
Madison, Wisconsin 53706

Extension Services in Pharmacy at the University of Wisconsin has been providing continuing education offerings for state pharmacists via the Educational Telephone Network (ETN) since 1966. During this period there has been at least one program presented each year, with an average attendance of over 400 practitioners (there are approximately 2,500 pharmacists in the state). Recently, telelecture programs have been modified and reproduced as audio cassette courses for distribution on a nationwide basis. The purpose of this paper is to describe the development of these cassette courses and the adaptability of the telelecture technique to reach larger numbers of learners over a wider geographical area.

The ETN is a private telephone network which links over 150 courthouses, hospitals, extension offices, and University of Wisconsin campuses throughout the state. Programs originating on the Madison campus may be heard over a loudspeaker at any listening location on the network. If the learner at any listening location desires to ask a question, he need only ask it. The question and the lecturer's response are heard at all the other locations on the network. This provides for two-way communication between the instructor and the students.

One of the major advantages offered by the ETN system is that it can reach individuals throughout the state. There are very few pharmacists in the northern counties of the state (only 56 pharmacists live in a 17 county area), which makes it impractical to present face-to-face programs for these practitioners. Conversely, "live" presentations in the Madison or Milwaukee areas cause hardship on pharmacists living outside these regions, because of the travel involved and the cost of closing or having coverage in their pharmacies while attending these programs. Using the ETN it is possible to offer convenient continuing education to all professionals in Wisconsin.

A problem with the telelecture technique is the geographical boundaries established by the system itself. Programs can only reach individuals within or relatively near the network locations. As mentioned, it is possible to reach all pharmacists in Wisconsin. However, valuable continuing education programs designed for this technique become inaccessible for practitioners any distance from the state. A second problem is most of the telelecture programming is broadcast on a one-time basis. Offerings are presented only once or several times during one day and then usually filed in departmental archives. Many of the programs could be reused and redistributed to other areas and audiences.

Since 1972, Extension Services in Pharmacy has been "recycling" many of its ETN programs by reproducing them on audio cassettes and redistributing them to pharmacists and other health professionals throughout the United States and Canada. The cassette courses consist of seven or eight one-hour lectures. Each lecture is supplemented with a printed study guide and a check test. Each study guide contains an outline and charts or diagrams to assist the individual listening to the cassette. The check test, intended to be taken after each lecture, is designed to help the learner discover those portions of the material to which he should devote further study. The cassettes, study guides, and check tests are housed in a single three-ring looseleaf notebook with cassette trays. A final examination is also available upon request. If pharmacists wish to receive continuing education credit, satisfactory completion of the final examination is the only basis upon which they are certified.

Many of the presently available courses were originally developed for telelecture broadcasts:

Selected Topics in Pharmacology (ETN-1971)
Clinical Drug Interactions
Over-the-counter Preparations--Dermatologicals (discontinued)
Pharmacologic Approaches to Disease States (ETN-1972)
Introductory Aspects of Clinical Pharmacy
A Rational Approach to Drug Selection (ETN-1973)
The Health Professional's Role in Diabetes Mellitus
Geriatric Considerations in Drug Therapy (ETN-1974)
Basic Clinical Pharmacology
Fluids and Electrolytes
Pediatric Considerations in Drug Therapy (ETN-1975)

Table 1 shows the increase in the number of pharmacists who can be reached utilizing audio cassettes. In total, over 10,500 cassette courses have been distributed to pharmacists and other health professionals during the first five years of this program.

Development and Implementation of Telelecture Courses

The selection of appropriate subject matter for ETN programs are based upon needs expressed by the practitioners and departmental interpretation of professional trends. Every course produced by Extension Services in Pharmacy (whether telelecture or other

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Table 1. Pharmacists Registering for ETN and Cassette Courses

Courses	ETN	Cassettes[a]	Totals[b]
Selected Topics in Pharmacology	394	1,243	1,637
Pharmacologic Approaches to Disease States	426	1,438	1,864
A Rational Approach to Drug Selection	521	450	971
Geriatric Considerations in Drug Therapy	495	381	876
Pediatric Considerations in Drug Therapy	490	0[c]	490

[a] Course distribution as of December 31, 1976

[b] Some pharmacists attending the ETN programs have also purchased the same cassette courses, however, these numbers are negligible

[c] Course was not ready for distribution until January 1977

techniques) is evaluated by the registrants. Most of the evaluation forms request suggestions of topics in which the pharmacists feel they need updating. Based on these recommendations and the use of planning committees composed of practitioners, appropriate topics are selected for telelecture courses and other programming methods.

Once the topic is determined and appropriate content for each lecture identified, lecturers are chosen based on their teaching abilities and subject matter expertise.

Standard format and production methods have been developed by the department.

> The lectures are prepared and taped from several weeks to several months in advance of the actual presentation. This allows sufficient lead time for the preparation and duplication of the handout material which has become an integral part of each course. During the past few courses an average of about 10 pages of such handout material has been provided for each lecture.
>
> ...Very few changes have been made since the original design was inaugurated. Slides were originally used to illustrate the first telelectures, but they have been replaced by printed copy distributed to the learners in advance so they can view them during the lecture, make notes on them if they wish, and retain them for future reference.[1]

Traditionally these courses have consisted of seven two-hour segments. The first hour of each segment is the presentation of the recorded lecture. The remaining hour is devoted to a live question and answer session between the registrants and the lecturer.

> Originally, questions were called for by roll call of locations. More recently, questions have been asked at random by the locations, thus conserving time for additional questions and discussion.[2]

The question and answer sessions are recorded and remain on file for evaluation purposes and for possible use in supplementing the lectures in the cassette courses.

This format has proven to be efficient for the department and an acceptable means of continuing education for pharmacists in Wisconsin. Participation in these programs and research projects have been previously reported.[3-5]

Conversion of Telelecture Programs to Cassette Courses

As mentioned previously, all telelecture registrants are mailed evaluation forms following the program. Those results are analyzed to determine the relative success of the course, its adaptability to cassettes and suggestions for future programs.

The decision to convert an ETN program to a cassette course is based on several points: 1) the relevance of the topic (both the success in attracting Wisconsin pharmacists and the projected audience on a nationwide basis); 2) the written evaluations and suggestions by registrants; and 3) the impressions of departmental members attending the course, as to the content and quality of the lectures. Decisions are also made regarding the re-recording or replacement of certain lectures and the possible production of additional lectures which might be necessary to make the cassette course a more beneficial learning experience. Two of the courses, "Geriatric Considerations in Drug Therapy" and "Pediatric Considerations in Drug Therapy," have each had additional lectures added to the original telelecture broadcasts.

Once the decision is made to convert an ETN program to cassettes, numerous changes are made: 1) existing tapes are edited, rerecorded or replaced; 2) in some cases, sections of the ETN question and answer sessions are edited and added to the original lecture; 3) introductory comments and directions are recorded and added to each lecture; 4) all the handout materials are modified to match the format used in the cassette study guides; 5) questions are developed for the check tests and final examination; and 6) cassette labels and binder covers are designed. The entire process may take from several weeks to several months, depending upon the extent of the necessary changes.

When the final product is ready, news releases are produced and course distributors notified. Extension Services in Pharmacy has established an international network of distributorships which in turn announce the availability of new courses. These include eleven schools of pharmacy (two of which are in Canada), two state pharmaceutical associations, and one international pharmaceutical journal. The extent of this network has resulted in the circulation of over 1,000 copies of five different cassette courses.

Certain quality control procedures are used to monitor courses as long as they are available through the department. The period between the development and actual presentation of telelecture programs is relatively short and there is little chance that the material will be out of date by the time of the broadcast. Cassette courses may continue to be distributed for five or more years. Thus, contents of the audio cassette courses are periodically reviewed to ensure that the subject matter is current. Supplemental pages have been added and tapes edited to correct changes in acceptable therapeutic regiments and to introduce new drugs marketed since the courses were originally produced. In addition, final examination questions are checked utilizing the FORTAP program at the Madison Academic Computing Center on the University of Wisconsin Madison campus.[6] This program performs item analysis and checks the reliability of the test instruments. Evaluation forms are also mailed to all pharmacists completing a cassette course. These forms are used to determine the acceptability of each individual course and detect any problems or general dissatisfactions which might exist.

Results of the Use of Audio Cassette Courses

Research has been conducted to evaluate the audio cassette courses produced by Extension Services in Pharmacy. In a preliminary project, pharmacists were studied to determine the general effectiveness and acceptability of this method of continuing education.[7] The course used in this first study was originally broadcast over the ETN. In a second study, a course was developed and evaluated for one subgroup within the profession.[8] In both cases, the cassette courses were found to significantly increase the pharmacists' knowledge (Table 2) and to provide an extremely acceptable and convenient method of postgraduate education (Table 3).

Cassettes like the telelecture technique make it possible to reach pharmacists who cannot leave their work responsibilities to attend on-campus programs. The compactness of both the tape and the tape recorder is a distinct advantage, especially with regard to storage and portability. Also, most cassette tape recorders can be operated on batteries as well as electrical outlets which adds to the portable and versatile nature of this type of continuing education. It is alleged that more material can be covered with greater comprehension in less time using audio tapes as compared with traditional face-to-face education.[9] Lastly, cassettes make learning possible on an individualized basis, since the tape may be stopped and replayed to fit the needs of the individuals and compensate for differences in the learners' capabilities and backgrounds. This is particularly important for pharmacists because of the wide range in their ages, educational backgrounds and types of practice.

Cassette courses developed by Extension Services in Pharmacy have proven to be versatile means of continuing education. Pharmacists in Wisconsin who attended the original ETN program have obtained copies of the cassettes for future references.

These courses have been used for both independent study and in group situations. Local pharmaceutical societies and hospitals have purchased copies to be maintained in a library for their members. For group learning, these associations have given individual tapes to specific members and requested them to study the lectures. During monthly meetings these members then play the tape for the assembled group and lead a discussion about the contents.

Courses have also been used by hospital pharmacists for nursing inservice programs and the course "The Health Professional's Role in Diabetes Mellitus" has been employed by community practitioners to instruct patients about this disease.

Table 2. Changes in Cognitive Knowledge Using Audio Cassettes

Study	Pretest(N)	Posttest(N)	Increase
Pharmacists (Blank, et al., 1975)	54.7% (136)	79.5% (134)	24.8%
Practicing Pharmacists (De Muth, et al., 1976)	48.3% (142)	87.6% (135)	39.3%
Nonpracticing Pharmacists (De Muth, et al., 1976)	15.6% (76)	85.0% (54)	69.4%

Table 3. Acceptability of Cassettes as a Means of Continuing Education

Statement (Study)	N	Mean ± S.D.[a]
Value		
The cassette tape lecture technique was a valuable learning experience. (Blank, et al., 1975)	135	4.5
Overall, the cassette tape course was a valuable learning experience to me. (De Muth, et al., 1976)	355	4.5 ± 0.6
Usefulness		
The information in the lectures will be useful in my pharmacy practice. (Blank, et al., 1975)	135	4.0
The information presented on this tape course was useful in my present pharmacy practice. (De Muth, et al., 1976)	248[b]	4.3 ± 0.6
Convenience		
Cassette tape recordings, in general, appear to be convenient and are timesaving means for professional continuing education. (De Muth, et al., 1976)	355	4.5 ± 0.6

[a] Based on a 5-point Likert Scale with 5 representing "strong agreement" and 1 representing "strong disagreement"

[b] Practicing pharmacists only

Summary

The Educational Telephone Network has assisted Extension Services in Pharmacy in reaching pharmacists throughout the state of Wisconsin. With slight modifications these programs have been adapted to audio cassette courses and can be used by all pharmacists outside the boundaries of ETN. Utilizing both systems together offers an excellent means of recycling valuable programming while reaching larger audiences of practitioners regardless of their geographical locations.

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CASE STUDY

TELECONFERENCE FOR CONTINUING EDUCATION OF PROFESSIONAL NURSES

by

Nancy J. Magel, R.N., B.S.
Consultant, Ada Area Continuing
Education Network, Ada, Oklahoma

INTRODUCTION

Manditory licensure for professional, registered nurses is now widespread across the nation and serves to protect the integrity of Nursing. In close pursuit of these statutes is manditory, continuing education for the practicing registered nurse; a proposal which is meant to insure quality for the health care recipient. While this concept is widely accepted, nurse educators, state licensing and examining organizations as well as professional nursing groups are encountering difficulty in providing the means to attain such continuing education credits. This difficulty lies primarily in:

1. Determining the number of Continuing Education Credits needed per year to maintain professional proficiency
2. Providing programs which are economically attainable for the average staff nurse
3. Locating programs in geographical areas which allow for maximum attendance
4. Recognizing staffing patterns in the rural as well as urban areas

While the individual state licensing and examining institutions will need to determine the number of Continuing Education Credits required to maintain proficiency; the providers of continuing education programs can and should solve the other problems.

BACKGROUND TO THE PROJECT

When the Ada Area Continuing Education Teleconference Network began investigating professional nursing continuing education programs they found the following:

1. Most programs were sponsored by Departments of Nursing in local Universities or Colleges as well as professional nursing organizations
2. Most programs were located in and developed for the urban communities
3. The average cost was from $35 to $150.00
4. Attendance was generally by first line managers and above rather than the staff nurse who provides the majority of direct patient care services

Since the Ada Area Continuing Education Network services a large rural population in Oklahoma one of their primary concerns was to provide equal opportunity for continuing education in these areas. From the data they collected above, the following goals were established:

1. To provide professional nursing, continuing education programs which would meet professional nursing criteria and standards
2. To provide such programs at a cost easily attainable by the average staff nurse in the rural hospital
3. To provide such programs in a manner that would allow for maximum attendance taking into consideration that many rural hospitals have very minimum staffing patterns
4. To direct the content of such programs toward the needs of rural nurses as well as the needs of their clients

With these goals established, the Ada Area Network contacted East Central University Department of Nursing in Ada and secured a Consultant to help establish the first venture. Together, we determined possible problems which might be encountered with nursing continuing education via Teleconference. Those which we felt should be of major concern were:

1. Many nurses are concerned with proficiency in technical skills and many of their courses are accompanied by demonstration labs
2. Nursing deals with data collection and assessment of individuals which requires visualization of the patient

It was decided that these points of concern might be counterpointed by means of area workshops to finalize a course as well as slide augmentation of lectures.

Our next major task was selection of a topic which would successfully launch the idea of nursing continuing education via Teleconference. During this planning stage the Ada Network and East Central University were engaged in a joint federal grant project directed toward rural emergency health care. Lay persons from the rural areas were receiving Emergency Medical Technician training. Therefore, it seemed wise to pool forces and direct the initial nursing program toward Emergency Room Nursing. The topic was pertinent, on the minds of all personnel in the rural health care facilities, and needed if the E.M.T. Course was to result in favorable outcomes. Nothing is more disheartening than to have well trained technicians bring a patient to an Emergency Room and then lose the victim on the threshold of success. We could see this happening in the rural areas very easily if the hospital personnel staffing the Emergency Rooms did not receive additional and specific training.

COURSE DEVELOPMENT AND PRESENTATION

A course for nursing continuing education was developed entitled *"EMERGENCY ROOM NURSING - assessment, goals and actions"*. The purpose of the Course was defined as "one to prepare nursing staff in Emergency Room Departments to provide immediate and temporary care to the patient suffering from accidental injury or sudden illness." The Course was designed to give the participant a body of knowledge based upon the theory and principles of emergency care which would enable him/her to assess the patient, make a nursing diagnosis and implement the appropriate technical skills. Registration for the Course was open to registered nurses, licensed vocational nurses and students of nursing.

The syllabus for the course was developed around the material being offered the E.M.T. and was reviewed by the physician conducting that program. It divided the course into the following eight Units:

I. The Emergency Situation
II. Resuscitation
III. Bleeding, Wounds & Shock
IV. Soft Tissue Injuries
V. Injuries to the Brain, Skull, Neck and Spine
VI. Injuries to the Extremities
VII. Medical & Environmental Injuries
VIII. Emergency Childbirth

It was our belief that the coordination of both programs would allow for better continuity of care. However, the nursing course was developed to include greater depth of content particularly in the area of pathophysiology.

Behavioral objectives for the participants were developed for each Unit. These were distributed to all registrants and were utilized as evaluation tools for the participants.

Since the course topic covered a vast amount of material the preparation of a textbook was selected in lieu of hand-out materials. The compilation of a manuscript was initiated in October, 1974 to encompass the same Units as listed in the course syllabus. The text was submitted to a local printer in December, 1974 for publication early the next year. The completed textbook consisted of approximately 95 pages and provided study questions and space for note taking at the end of each Unit.

The textbook provided basic theory and principles of care in regard to the selected topics in each Unit. This allowed for the development of lecture material which dealt with in-depth physiology as well as newer concepts and research in the field of Emergency Nursing. Sixteen one (1) hour lectures were prepared to be given for one (1) hour each week over a period of two (2) months. Since one of our concerns was the need for visualiztion of patient situations in the education of nursing staff, slides were obtained to augment the lecture presentations. These were duplicated for each participating hospital for use during the course. The lecturer would announce which slides were to be used during each lecture and a course coordinator in the hospital would show the slides to the participants when indicated by the lecturer during each class session.

Early dissemination of the proposed course brought requests for a certificate of completion of the program. In addition, the Oklahoma State Nurses' Association agreed to offer Continuing Education Credit. It was felt that in order to meet these criteria as well as the behavioral objectives which were established for the Course, adequate testing and evaluation must be performed.

Objective tests for each Unit were compiled and sent to each participating hospital course coordinator. These tests were administered by him/her following the completion of each Unit. The tests were then returned to the Network Center for evaluation and grading. All records were maintained by the area office. A pass-fail grading system was established whereby the participant must complete all tests with an overall average of 70%.

In addition to the testing of theory, it was decided that adequate performance of certain technical skills was inherent in successful emergency nursing care. Since another one of our major concerns in continuing education for nurses via Teleconference was the demonstration of such skills an all-day Workshop was formulated to complete the course and meet these requirements.

Due to the large geographical area serviced by the Network it was necessary to schedule the same Workshop at various sites throughout the area so that all participants would be able to attend without any undue difficulty. The program for the Workshop included the following:

1. Current films on Resuscitation
2. Demonstration and practice of current resuscitative techniques
3. Demonstration and practice of the management of soft tissue injuries including TRIAGE
4. Demonstration and practice of the management of injuries to the extremities including splinting
5. General review and discussion of the course including a question and answer period

Participants who could not successfully complete the demonstration portion of the Workshop did not pass the course regardless of their test scores.

PARTICIPANT RESPONSE

During the early days of development we had hoped to keep the registration around 250 persons. However, we were quickly deluged with applications and the first offering of the Course opened with well over 500 participants. Registration cost of the first program was $10.00 due to the assistance of the federal grant. The course was presented from 12:30 - 1:30 P.M. on Wednesdays which was requested by those who registered stating this was the most convenient time and day and would allow for maximum attendance. In the rural hospitals many participants brought their lunches which allowed the hour to serve a dual purpose.

The majority of the participants did well on their written tests and capably performed during the one day Workshop. They voiced particular pleasure in attending the Workshop; not only because of the opportunity to verify technical skills, but because they were able to meet the instructor face to face. This seemed to be of major concern to all the participants after the sixteen weeks of Teleconference.

Evaluation by the participants of Teleconference as a media for continuing education for Nursing met with an overwhelming affirmative response. They repeatedly voiced their desire to attend such educational programs, but being unable to afford the cost and time of programs offered throughout the state via other methods. Many of the participants were one of 3-5 registered nurses staffing a rural hospital.

LECTURER RESPONSE

Having had all previous lecture experience in front of a live audience with visual contact I was very much concerned regarding the impact of a lecture without being able to see the participants. My concerns centered around:

1. Would personalities come through, not only mine, but the participants as well
2. Would it be difficult to gauge the attention span of the participants
3. Would I be able to assess if the participants understood what was being said, was the material clear and concise, understandable
4. Would I be able to elicit questions readily if there was confusion or misunderstanding of the material

As the first lectures began I found myself talking rather rapidly and filling the hour from start to finish with lecture material. Retrospectively, I suppose this was due to my inability to come to a solution for the concerns listed above. And, initially the participants hesitated to interrupt, ask questions, and in general do nothing more than listen. This may have been because they couldn't get a word in edgewise as well as because of the new media of Teleconference for continuing education.

However, as time went on I gained more confidence and began assessing the original concerns I had in regard to Teleconference. I slowed my presentations and planned less lecture material for each hour allowing 10 minutes at the end of each program for questions. Initially there was dead silence and it was extremely hard for me not to proceed with the material from the next lecture. Since absolute silence on the other end of the wire was not what I had wanted I began to familiarize myself with the names of the participating hospitals so that I could seek questions from these participants by calling on the hospital name. When I did elicit a question I would ask the participant to identify himself/herself and soon I was able to call on individuals to get "the ball rolling" at the end of each lecture. It was not long before the participants began asking many questions and we had a tremendous means of sharing concerns, techniques and problems among some 500 health care personnel. This was perhaps the most impressive and rewarding portion of the Teleconference system for me personally.

Once active participation began I quickly found that my previous concerns were unfounded. Personalities did come through as we laughed and argued together. I could interpret when they were confused about material presented by the intonation of their voice. And when it came time for the Workshop we all were amazed at how well we felt we knew each other. There were many voices that we enjoyed putting faces to after sixteen weeks.

In general, I must admit that Teleconference did not present any problems different from those one may encounter in the classroom setting. If anything, the participants were more attentive, eager and enthusiastic. The lack of visual perception was seemingly not missed as much as educators tend to believe. Learning did occur which is the goal of any educational endeavor. For me, it was one of the most challenging and rewarding experiences of my career.

SUMMARY AND CONCLUSIONS

The initial Teleconference in continuing education for nurses was very successful in the Ada Area Network. This was evident by the large registration and successful completion of the program by the participants. We were extremely fortunate to be able to launch the first program under the auspices of a federal grant as this made the cost of the program very low and available to many individuals in the rural areas of Oklahoma. However, it has been found since that time that additional programs can be offered at less cost than many others presented in the urban areas. The media lends itself to this capability particularly when you include the cost of travel, accomodations, meals and loss of work which must be considered for rural health care personnel.

It was also very rewarding to see that the Teleconference method did meet the needs and was capable of providing effective continuing education for health professionals, particularly nurses. As the continuing education for nurses becomes manditory it is comforting to know that there is a media available that can provide outstanding and renown speakers from anywhere in the United States, service large numbers of participants, meet the criteria and standards of continuing education nursing crediting organizations and can do this at a reasonable cost to the participant who may attend right in their own hospital setting.

NOTE: "EMERGENCY ROOM NURSING - *assessment, goals and action*"

available from: Ada Area Continuing
Education Center
Valley View Hospital
1300 East Sixth Street
Ada, Oklahoma 74820

INSTITUTING EXTENDED AND SHORT TERM OFFERINGS IN MUSIC EDUCATION FOR TELECONFERENCING

Edward O. Hugdahl
Professor of Music and Chairman
University of Wisconsin Extension Music Department
Madison, Wisconsin

Going the Teleconferencing Route

During the past four years the University of Wisconsin Extension Music Department has been utilizing teleconferencing for some of its state-wide programs. The availability of the unique University of Wisconsin Extension Educational Telephone Network (ETN) and the encouragement, guidance and cooperation of its administrators caused exploration and experimentation with this communications system.

Achieving greater state-wide impact for programs in music was an initial factor in experimenting with this medium. Rising travel costs as well as unavailability of staff to do extended series of programs in various regions of the state in order to achieve greater coverage in the state were part of the mounting problems. The mission of the UW Extension Music Department is one of developing programs in adult and extension music education for the entire state. Such a mission, of course, has great challenges. Reaching the remote regions of the state where the citizens are equally deserving of educational services from the state university as well as those in the more populated and readily accessible regions is a dilemma, especially as costs rise and budgets are constrained. Further complicating the situation is that sparcely populated areas do not have sufficient enrollment potential to bring in a specialist and a workshop to support it.

Venturing into using a communications system was perhaps even overdue in a technological age. There were no previous experiences in music education utilizing teleconferencing to draw upon. Earlier experiences in teleconferencing in other subject matter areas provided invaluable insight in these initial years. Teaching music, of course, has unique problems and they had to be dealt with.

There was skepticism on the part of many colleagues that teleconferencing would not be effective for music. Even after four years of successful experiences there are many who do not understand the entire principle of teleconferencing and the UW Extension Educational Telephone Network (ETN).

The installation of high fidelity speakers in 1974 in the UW Extension ETN system greatly enhanced the potential for teaching music. Music is transmitted at an amazing fidelity for teaching purposes on this system. Such potential, of course, is needed if music is to be effectively taught.

With Whom To Begin

Just where to begin in initiating offerings in music utilizing teleconferencing was a haunting question. Music is a complex field with a great number of specializations and sub-specializations. For example, there are three levels for public and parochial school music teachers: elementary school, junior high school and senior high school. At each level there are four subject matter areas: band, orchestra, chorus and general music. Special skills and expertise are needed for each school level as well as subject matter area.

There are also large numbers of private piano teachers and spinet organ teachers. In church music there are organists, directors of adult, youth and children's choirs. There are college teachers and music education majors. Actually, the music industry is a very broad and encompassing field involving hundreds of categories.

The initial venture for music in teleconferencing in Wisconsin was for private piano teachers. A mailing list of some 4,000 private piano teachers had been developed prior to 1973 in efforts to provide continuing educational offerings for this segment of the music scene. Identifying who teaches piano privately is a never ending challenge. It is a well-known fact that there are many piano teachers with as few as five to ten students per week. Because there is no state registration or licensing of private teachers in Wisconsin and because not all belong to state associations of private piano teachers, identifying this clientele is a slow and arduous process.

The next clientele group for whom teleconferencing was used was the school music educator. Identification of this group is very easy as the Wisconsin State Department of Public Instruction has listings by name of every music teacher in the public elementary and secondary schools of the state in two categories: vocal teachers and instrumental teachers. Experience in programming for music educators is that it is more effective to send brochures to music teachers by individual name instead of just sending one brochure to a school. In this way every teacher in a school gets a program announcement. With private and parochial schools, however, all that can be done is to send the brochure to the music department of the school, since there is no listing by name of music teachers. Lists of private and parochial elementary and secondary schools are obtainable through the Wisconsin State Department of Public Instruction.

The third clientle group for which teleconferencing was used was teachers of spinet organ. The reason for initiating programming for this group is that in 1974 for the first time in the history of the keyboard industry, unit sales of organs surpassed piano sales. Further, there is a wide range of quality in teaching of the spinet organ. Previous programming by the UW Extension Music Department never included this clientele group, so there were no previously developed mailing lists. Identification of who was engaged in spinet organ teaching was very difficult. By working through music stores and organ dealers an initial identification was made. Since some piano teachers also include spinet organ teaching the existing mailing lists of piano teachers were used to send program announcements.

When beginning programming it is essential to carefully identify a clientele group for whom to design a program offering. While announcements in the press are valuable, and it is essential they be used, direct mail is crucial.

Program Planning Committees

In order that programs are designed to meet the needs and interests of clientele groups efforts have been made to involve state organizations and agencies to become involved in endorsing the program and to appoint advisory committees to guide in the program emphases.

The offerings for music educators are offered with the endorsement of the Wisconsin State Department of Public Instruction as well as in association with two state music organizations, the Wisconsin Music Educators Conference and the Wisconsin School Music Association. Both the Wisconsin Music Educators Conference and the Wisconsin School Music Association appoint members to advisory committees to plan the year-long offerings of the UW Extension Music Department on the UW Extension ETN. The Consultant in Music for the Wisconsin State Department of Public Instruction works closely in determining final selections ultimately being offered for school music educators.

The Wisconsin Music Teachers Association, a state organization of private music teachers, appoints an advisory committee to give guidance in programming for private music teachers.

Such endorsements from state agencies and associations aid greatly in having music educators and private teachers participate in continuing education offerings on a communications system. The advisory committees give valuable suggestions on the most pressing needs and issues confronting the profession.

Promotion

A brochure is developed for each individual offering presented and sent to the available mailing lists. Most enrollments result from direct mail.

There are general news releases through the usual public information departments as well as listings in regular UW Extension general catalogues and ETN newsprint. These avenues of promotion reach persons not on regular mailing lists. While this is not many, it is still critical that more people are identified as being in the field, such as private teaching.

It is interesting to note that in the survey of private piano teachers in an offering in the spring of 1976, 45% had learned about it from their being on the mailing list of the UW Extension Music Department, 12% read about the offering in a newspaper, 16% had learned about it from the UW Extension County Office and 10% had learned about it from other persons.

In Appendices I and II there are examples of full page advertisements which have been used in the journal for state music educators. These are attempts to show a total year's program as well as create an awareness of the availability of the UW Extension ETN in every county in the state, as well as showing the resources which are becoming available to music educators through this medium.

Overcoming An Image

Music programming on the UW Extension ETN is still in its infantcy. The percentage of the total school music educators and private music teachers who have experienced ETN programming is very small in comparison to the potential available. While the Wisconsin system is ten years old and those who work with it so intimately would like to think it is well known, in actuality the Wisconsin system is one of the finest unknown, misunderstood and untapped educational resources in the state.

There are several reasons for this. Perhaps most basic is that using teleconferencing for any purpose of music is totally new to the music profession. Further, considering a communications system as a possibility or alternative for continuing education is also a new concept.

The skeptical always raise the aspect of the lack of visual in this communications system. It is constantly stressed that music is an aural art and that an aural communications system is a natural for an aural art. Of course, disseminated visuals can assist in those presentations requiring visual assistance to communicate subject matter.

Overcoming the "radio syndrome" is a great challenge. For those who have not experienced teleconferencing the speakers at ETN listening locations remind them of radio. It is crucial, of course, that they realize the potential of two-way communications and that they can personally question and discuss problems and issues with leading authorities any where in the country. Very rarely would one have such opportunities. This underscores the point that visual image or physical presence is really not needed to probe ideas and concepts. Up to this point in the profession musicians have thought that physical presence is necessary to communicate concerns in their art.

As is often the case in the Wisconsin situation a music teacher is alone at an ETN listening location. For music teachers who are usually with groups in their teaching and performing, being alone can be an initial adjustment when experiencing ETN for the first time. Every attempt is made when conducting programs to have everyone feel being part of a state-wide classroom that is linked together electronically even though its class members are hundreds of miles apart and the instructor is half a continent away.

Today the various media almost dominate the lives of everyone. Music educators, however, whose art is heavily involved in the media, have a reluctance to use a communications system for continuing education purposes.

Adapting To The System

Every attempt is made to select instructors who will be effective using a communications system. It is always encouraging to experience how readily instructors can adapt and adjust to the unseen class. Music instructors are all conditioned to group situations where they frequently vary their presentations upon observing the reactions of the students. Instead of modifying presentations on "seeing the whites of their eyes" instructors using ETN are encouraged to present short bits of materials and then sollicit questions of the class either generally or by name. In this way instructors can hear this involvement. It helps alleviate the lonely feeling for the instructor as he or she talks into a microphone or ordinary telephone.

Instructors are encouraged to develop printed material, bibliographies, charts and diagrams as visual aids. These are duplicated and disseminated to the participants. It is an effort to compensate for the lack of visual in this medium as well as save valuable time on ETN for two-way communication between student and teacher.

Short Term and Long Term

Both short term and long term offerings in music have been presented on the UW Extension ETN. In long term offerings there is an opportunity to explore in depth. Short term offerings have appeal when there are ever-increasing demands on one's time.

For private piano teachers the experience to date has been presenting two or three session offerings. These two hour sessions have been presented in consecutive weeks as well as on an every-other-week basis; attendance holds equally for either approach. Because of the unpredictable Wisconsin winter driving conditions, offerings for private piano teachers have been in the fall and spring. Morning hours from 10:00 AM to noon on Mondays, Tuesdays and Wednesdays are most successful. Longer offerings for private piano teachers have not yet been attempted because motivating the private piano teacher into continuing education experiences is difficult, even in traditional settings; using a communications system is even more of an adjustment.

For school music educators three types of offerings have been presented: (1) semester long (14 weekly ninety minute sessions); (2) short term (2, 3 and 4 ninety minute sessions); and (3) year-long program offerings composed of 2 and 3 ninety minute session segments. In the semester-long offering a face-to-face meeting of instructor and students in the class was scheduled during the State Music Educators Convention which is an event attended by all music educators. Short term offerings seem to appeal to music educators whose time has many demands upon it. Appendices I and II show how a year-long, comprehensive program has been developed for the past two years for various apsects of music education which is composed of 2 and 3 session segments. Each segment is promoted with its own brochure. Ultimately, it is hoped that once the concept of continuing education being effective on teleconferencing is established that there be one yearly catelogue on the various offerings for school music educators.

Teleconferencing Can Be Used For Instrumental Needs

Piano was the first instrument used for teaching purposes on the Wisconsin system. The microphones of this system are able to pick up at any amazing fidelity all of the subtlety of touch, dynamics, phrasing and nuance used in piano performance. The piano demonstrations used by the various artists and piano pedagogues equal in quality of learning that which is obtained in traditional face-to-face instruction.

In 1977 the first attempt was made in meeting the needs of junior and senior high school orchestra teachers and their student cellists. An experimental series was presented in which junior and senior high school orchestra teachers brought several of their student cellists to an ETN listening location. A master cello teacher worked on technical material and musical interpretation with the student cellists. Each student played cello literature from the state high school music contest list, since this is standard repertoire. Further, contest music served as a motivation for the students who would be playing this music in subsequent music contests. The master cellist is a person who believes strongly that cello performance depends greatly on critically listening to the sounds one creates as one evokes sound from the instrument. Hence, his not seeing the cellist as he or she played was no problem whatsoever to him. On the basis of what he heard recommendations were made on how to improve, such as bowing closer to the bridge or finger board of the instrument, more or less bow or closer to the frog or tip of the bow. The improvement in the quality of the performance of the students as they responded to these suggestions was dramatic. The standard equipment at the various ETN listening locations in Wisconsin was most adequate to transmit the quality of sound needed in such an endeavor. The teacher merely held the microphone about six inches from the birdge of the cello as the student played. It was exciting for students and teachers alike, many hundreds of miles away from the master teacher. Students were inspired by their peers and teachers, for whom the project was primarily intended, gained from observing how a master teacher works aurally to obtain more music from an instrument and a player. These students were typical of the various stages of development in the junior and senior high school cellist that the school orchestra director works with daily.

Almost every elementary and junior high school in Wisconsin has an Autoharp in its inventory. Many are gathering dust for lack of skills and techniques in playing it more imaginatively, creatively and artistically. This very portable and versatile instrument can be most effective in school music programs. An offering was presented in 1977 for school music educators to increase their knowledge and skill in using this instrument. The instructor, one of the finest in the world, was in her living room in New Jersey, half a continent away. Again the microphone equipment was equally effective for music teachers in Wisconsin to play from their locations in Wisconsin, be heard by their colleagues at other listening stations in Wisconsin as well as by the instructor in New Jersey. Exposure to the thinking, artistry and critique of the foremost authority on Autoharp was another example of the tremendous resources which can be "brought" to the state with statewide access by using the principle of teleconferencing.

Teleconferencing Can Be Used For Special Teacher Needs

Teleconferencing has been used effectively to meet specific problem areas in music. One such area is that of encouraging private piano teachers to improve themselves professionally by working towards certification in the Wisconsin Music Teachers Association.

The Wisconsin Music Teachers Association is a state association of private music teachers which is affiliated with the national organization, the Music Teachers National Association. The Wisconsin Music Teachers Association has a program which certifies the professional competancies of private teachers by passing a series of tests in music theory, history, literature, pedagogy and teaching effectiveness.

The written and aural aspects of music theory, frequently an impediment for many teachers, was effectively presented through the teleconferencing medium. Hopefully, participants will better be able to negotiate their tests in the Wisconsin Music Teachers Association certification plan because of their preparation in these offerings.

About 50% of the piano teachers in Wisconsin do not hold a collegiate degree. It is the person without a degree who, it is hoped, will aspire to the certification program of the Wisconsin Music Teachers Association. Hence, the offerings presented in the written and aural aspects of music theory are designed and presented for the non-college graduate.

In Summary

Both long term and short term offerings in music can be successful using teleconferencing.

Focusing on a particular clientele group and assessing its needs to design a program is recommended when initiating programming. Program planning committees can aid in developing program emphases.

There is a great challenge to inform people about the potential of teleconferencing and that it is a viable medium to use in continuing education.

Teleconferencing is a most flexible medium to which many aspects of music can be adapted.

APPENDIX I

UNIVERSITY OF WISCONSIN EXTENSION MUSIC

in cooperation with
Wisconsin State Department of Public Instruction
and in association with
Wisconsin Music Educators Conference
Wisconsin School Music Association

present

OPPORTUNITIES FOR MUSIC EDUCATORS 1975-1976

available in every county in Wisconsin via
UW-Extension Educational Telephone Network (ETN)

September 10, 17, 24, 1975 *(3 Wednesdays 6:30-7:50 PM)*	**MUSIC ADMINISTRATION AND SUPERVISION** *Ray Robinson, President, Westminster Choir College* *Robert Klotman, Indiana University and President-Elect of MENC* *Rhoderick Key, Eastern Illinois University*
November 5, 12, 19, 1975 *(3 Wednesdays 6:30-7:50 PM)*	**THE WIND ENSEMBLE IN THE HIGH SCHOOL MUSIC PROGRAM** *Eugene Corporon, University of Wisconsin-Madison* *H. Robert Reynolds, University of Michigan* *Stanley DeRusha, University of Wisconsin-Milwaukee*
Nov. 24, Dec. 1, 8, 1975 *(3 Mondays 6:30-7:50 PM)*	**IDEAS FOR GENERAL MUSIC** *Virginia Watson, Milwaukee Public Schools* *William Schmid, University of Wisconsin-Milwaukee* *Joan Davies, Kenosha Public Schools*
January 7, 15, 1976 *(1 Wed., 1 Thurs., 6:30-7:50 PM)*	**CAREERS AND CAREER EDUCATION IN MUSIC** *Richard Pettibone, Janesville Public Schools*
January 13, 20, 27, 1976 *(3 Tuesdays 6:30-7:50 PM)*	**BOYS CAN AND WANT TO SING** *Kathleen Nolin, Copely Jr. H.S., Copely, Ohio* *George Bragg, Texas Boychoir, Ft. Worth, Texas*
March 10, 17, 24, 1976 *(3 Wednesdays 6:30-7:50 PM)*	**CHORAL CONCEPTS** *Elaine Brown, Temple University, Philadelphia* *Charles Hirt, University of Southern California* *Russell Mathis, University of Oklahoma-Norman and President of ACDA*
March 31, April 7, 1976 *(2 Wednesdays 6:30-7:50 PM)*	**ISSUES FOR COLLEGE MUSIC EDUCATION MAJORS** *Michael George, Wis. State Dept. Public Instruction* *Ralph Houghton, Kenosha Public Schools and Past-President WMEC* *Richard Gaarder, Wisconsin School Music Association*

Continuing Education Units Available

For information

UW-Extension Music
Attn: Edward Hugdahl
610 Langdon Street
Madison, Wisconsin 53706
608-263-2954

APPENDIX II

UNIVERSITY OF WISCONSIN EXTENSION MUSIC

in cooperation with
Wisconsin State Department of Public Instruction
and in association with
Wisconsin Music Educators Conference
Wisconsin School Music Association

present

OPPORTUNITIES FOR MUSIC EDUCATORS 1976-1977

available in every county in Wisconsin via
UW-Extension Educational Telephone Network (ETN)

Sept. 27, Oct. 11, 25, 1976 *(3 Mondays 6:30-7:50 PM)*	**IMPROVISATION: TEACHING IT IN GROUP SETTINGS** *Dominic Spera, University of Wisconsin-Eau Claire*
Sept. 29, Oct. 6, 13, 1976 *(3 Wednesdays 6:30-7:50 PM)*	**DESIGNING MUSIC COURSES FOR NON-PERFORMERS IN JR. AND SR. HIGH SCHOOLS** *Cynthia Thomas, Winneconne Public Schools* *Wilfred Gesch, Sr., Principal, Sheboygan Cooper School* *Patrick Neuman, Delavan-Darien High School* *Alvin Glaeser, Principal, Valders High School* *Ronald DeVillers, Milwaukee Pulaski High School* *Robert Wessler, University of Wisconsin-La Crosse*
November 3, 10, 1976 *(2 Wednesdays 6:30-7:50 PM)*	**TEACHING MUSICAL CONTENT IN PERFORMING GROUPS** *Joseph Labuta, Wayne State University, Detroit*
December 2, 9, 1976 *(2 Thursdays 6:30-7:50 PM)*	**PUTTING MUSIC INTO THE MAINSTREAM OF THE ELEMENTARY CLASSROOM** *Eunice Boardman Meske, University of Wisconsin-Madison*
Jan. 17, 24, 31, 1977 *(3 Mondays 6:30-7:50 PM)*	**ASSESSING MUSICAL LEARNING** *Edwin Gordon, University of New York at Buffalo* *Paul Lehman, University of Michigan at Ann Arbor* *Richard Colwell, University of Illinois at Champaign*
Jan. 10, 26, Feb. 14, 1977 *(2 Mondays 6:30-7:50 PM 1 Wednesday 8:00-9:30 PM)*	**THE CELLO: TECHNIQUES AND REPERTOIRE FOR H.S. CELLISTS** *Lowell Creitz, University of Wisconsin-Madison*
February 9, 16, 1977 *(2 Wednesdays 6:30-7:50 PM)*	**NEW TECHNIQUES FOR THE AUTOHARP IN THE CLASSROOM** *Meg Peterson, Autoharp Specialist, Summit, New Jersey*
Feb. 23, Mar. 2, 9, 1977 *(3 Wednesdays 6:30-7:50 PM)*	**IMPROVING INSTRUCTION THROUGH EFFECTIVE SUPERVISION** *Catherin Nadon, Montgomery County Schools, Maryland* *Don Robinson, Fulton County Schools, Atlanta, Georgia* *Max Ervin, Tuscon, Arizona, Public Schools*
March 23, 30, 1977 *(2 Wednesdays 6:30-7:50 PM)*	**MAINSTREAMING IN MUSIC** *Betty Welsbacher, Wichita, Kansas, State University*
April 20, 27, 1977 *(2 Wednesdays 6:30-7:50 PM)*	**ISSUES FOR COLLEGIATE MUSIC EDUCATION MAJORS** *Student MENC Chapters and Advisors in Wisconsin*

Continuing Education Units Available

For information

UW-Extension Music
Attn: Edward Hugdahl
610 Langdon Street
Madison, Wisconsin 53706
608-263-2954

A BRIEF REVIEW OF THE WORK OF THE COMMUNICATIONS STUDIES GROUP
1969 - 1977

Sandy Hammond and Ederyn Williams
Communications Studies Group
London, England

The Communications Studies Group, University College London, was established in 1969 to carry out research into the effectiveness and impact of advanced person-to-person telecommunications. Now that the group is about to disband it may be useful to give others a summary of the work which was carried out there. During the early years of the group's existence, research was strongly orientated towards an understanding of the potential for telecommunications in the world of business and government. This was partly because of the fact that the largest numbers of users of telecommunications are (and will be in the foreseeable future) office-workers, and partly because of the specific interests of the sponsors of the early research. This is not to say, however, that the findings are applicable only in these areas. Much of the psychological research into, for example, the effectiveness of various media for exchange of information, the studies of user reactions, acceptability of the media, person perception and the importance of accessibility, are applicable to users of telecommunications in all fields including education. More recently, the work of CSG has diversified to include telecommunication in medicine, teaching by telephone in the Open University, and telecommunications aids for the deaf.

The initial work of the CSG was funded jointly by the British Post Office and the Civil Service Department of the British Government. As the group grew and its interests diversified, it attracted financial help from a number of organizations, namely:

- Civil Service Department (Management Science and Operations Research)
- Civil Service Department (Telecommunications Division)
- Post Office (Long Range Studies Divisions)
- Department of the Environment (Directorate of Research Requirements)
- Social Science Research Council (Psychology)
- Social Science Research Council (Educational Research)
- General Electric (Research and Development Headquarters)
- Federal Department of Communications, Canada (Social Policy and Program Branch)
- Federal Department of Communications, Canada (Communications Research Center)
- Nordic Working Party on Conference Telephone
- Stanford Research Institute (contracting for National Science Foundation, Research Applied to National Needs)
- New Rural Society Project, Fairfield University (contracting for U.S. Department of Housing and Urban Development)
- Office of Scientific and Technical Information
- Organization for Economic Co-operation and Development
- Imperial Chemical Industries
- American Telephone and Telegraph

Naturally, all these sponsors had somewhat different interests in funding research at CSG. These ranged from a need to know the extent to which the "communications damage" produced by relocation of office workers could be repaired by telecommunications (Civil Service Dept., MSOR), to a wish to understand better the problems of information provision in an urban area (Dept. of Environment). Nonetheless, there was a core area of research effort, and a common orientation of the research approaches, so that one can meaningfully discuss CSG's research as a whole.

Orientation of CSG's Research Approach

In specifying this approach, we could do no better than to quote from a previous overview of CSG's research[1]:

> "Prior to the establishing of the CSG there had been no systematic investigation of the effectiveness and impact of advanced forms of person-to-person telecommunications or, if there had, they defied many and determined efforts to locate them. This, of course, did not prevent commentators from propounding strong and, in the light of present knowledge, extreme views. There were, and are, those who believe that all future communication could be handled from home through electronic media. There are those who consider that telecommunications can provide, at best, an inferior and generally inadequate substitute for today's face-to-face meeting. Although it is not surprising that the last three years' research has demonstrated the falseness of such positions, by no means all the group's results could be described as intuitively obvious. It can be shown, for example, that the speech-only medium is, for some purposes, significantly more effective than either television or a face-to-face meeting. And even the eminently reasonable assumption that it becomes progressively more economical to substitute telecommunication for travel as the distance between the parties concerned increases is not altogether true. More curious than such examples is the previous lack of emphasis on research into the efficiency of telecommunications; and this, despite general acknowledgement of the crucial importance of communications to organizational efficiency and despite past expenditures of hundreds of millions of pounds around the world on technological R and D. In the last few years there have been some embarrassing failures in the marketing of expensive televisual systems in more than one country. Research such as that reported here cannot eliminate such risks altogether but, as we are sure the reader will judge, it can reduce them appreciably."

The mainstream of CSG's research was concentrated in the following areas:

1. Examining the utility of advanced telecommunications by studying their effectiveness in the performance of various communications activities.

2. Studying the acceptability of these media to the users.

3. Combining the above two factors with costings of the various media, studies of patterns of communication within organizations, and other factors which help to build a picture of the likely demand for advanced telecommunications.

4. Examining the implications of effectiveness, acceptability, costs, etc., for the use of telecommunications in relocating offices, in government, education, medicine and other fields.

The range of research was in part governed by the range of telecommunications systems covered. Our concentration upon user's needs and behavior led us to study primarily terminal devices. Other aspects of the system (e.g. bandwidth of transmission system, type of switching) were considered only indirectly through their influence on costs, system capability or other factors that might influence utility to the users. Aspects that are essentially user transparent (e.g. Strowger verses cross-bar exchanges or analogue verses digital coding) were nowhere considered in depth.

The terminal devices and systems that were considered include:

1. Loudspeaking telephone - like ordinary telephones but with separate microphone and loudspeaker, rather than a headset.

2. Audio conference systems - for example, the Remote Meeting Table which accommodates six people, each with their own loudspeaker and microphone, and also gives speaker identification.

3. Videotelephones - telephones with a two-way video capability, and normally a small, black and white picture.

4. Videoconferencing - two-way closed circuit television for meetings between groups of people.

5. Local access cable TV - by which locally originated programs are distributed to homes via cable.

6. Telex - point-to-point or "broadcast" typewritten messages.

7. Facsimile - remote copiers, by which a copy of any suitably-sized sheet of paper can be sent to another location.

8. Electrowriters - a remote pen device, such that anything written or drawn at one location is reproduced at another.

9. Word processors - devices that allow the assembly and editing of typed material.

10. Computer mediated conferencing - communication via computer terminals and an intermediate computer.

11. Advanced telephone facilities - special exchange or handset facilities such as keyphones, direct dialing inward and automatic transfer.

Even the plain old telephone service proved to have aspects where research or planning could be beneficial.

There telecommunications services were assessed in a number of ways.

The major approaches were:

1. Quasi-theoretical analysis, where existing knowledge about telecommunications media, human communication and other relevant topics was integrated in such a way that predictions, hypotheses or merely problems concerning the future utility of new media were discovered.

2. Effects of media on task outcomes, where the standard methodology of laboratory experiments was used to compare the outcome of various tasks according to the medium of communication that was used by the participants in the experiment.

3. Attitudinal surveys, where users of new devices, either in the laboratory or the "field", were asked their opinion of the usefulness, effectiveness or other aspects of the medium.

4. Communications audits, where respondents recorded some or all of their communication via specified media, and noted various aspects of the communication (length, participants, topic etc).

5. Costing studies, where the precise costs of various media were compared, and the break-even between two media for various lengths of communication, distance between communicators, etc. was calculated.

Not all these methods were used for all the media. Most of the effort concentrated upon teleconferencing and other "voice" media, and a relatively large amount of effort went into the study of task outcomes, and into communication audits, as compared to the other areas. Clearly there would be new combinations of telecommunication services and methodologies which could be usefully studies in the future.

It would be impossible to adequately summarize here the 200 or more reports written at the CSG, but we would like to mention a few which are representative of the main research areas, and then give a summary of the major conclusions which have arisen from this research.

Studies of Effectiveness and Acceptability of the Media

The "effectiveness" studies were largely experimental, using the theories and methodology of social psychology to determine the ways in which the use of various media affected the outcome of a communication "task". Such tasks included problem-solving, bargaining, giving factual information, resolving conflicts, and persuasion. The effects on speech patterns, interpersonal attraction, person perception, and formation of allegiances or coalitions amongst participants were also studied. Studies of acceptability and attitudes towards the media were also largely carried out as laboratory experiments, using semantic differential scales and other techniques drawn from social psychology to rate the media.

A useful overview of CSG's research into effectiveness and acceptability can be found in Short, Williams and Christie (1976)[2], while Young[3] gives a critical evalution of the ways in which psychological research has helped to understand and predict choice between teleconferencing and travel. On a less theoretical level, a paper by Hammond and Elton[4] presents the main results of the psychological research in a way which might be useful to organizers and users of teleconference system.

Communications Surveys

While the psychological aspect of CSG's work dealt with the behavior and reactions of users, this information needed to be combined with studies of the types of communication which takes place amongst people likely to be the future users of telecommunications. Because these people -at least in the immediate future- will be largely office workers, studies were carried out determining and classifying the types of office communication which now takes place. By developing a system of classifying business meetings, the results of the psychological research could be used to find the proportion of meetings which were potentially substitutable by the various telecommunications media.

The results of this classification (described in pye, Champness, Collins and Connel, 1973)[5], were used in a further study (Connell, 1974)[6] in which 1,791 meetings were surveyed, classified, and allocated tentatively to various telecommunications media.

Costs: Telecommunication verses Travel

A further factor to be taken into account when considering the potential usefulness of telecommunications is obviously their cost compared with more established forms of communication. Several studies of the relative costs of travel and telecommunications were carried out by the group, the most recent being by Cook (1975)[7] using British costing data, and by Pye (1976)[8] using U.S. and Canadian data.

The Choice to Telecommunicate

One cannot assume that, because a telecommunications system is objectively effective for a certain task and also cost-effective, people will use it rather than travel. In fact, research has shown that these factors may be relatively unimportant compared with other involved in the decision. Case studies of the use of various teleconference systems have been carried out to examine the reasons for the choice to telecommunicate, and results indicated, amongst other factors, the importance of organizational and group norms in this decision. In addition, several experiments (see for example, Christie, 1975)[9], were conducted in which users of a specific system were asked whether or not they would use it in given circumstances rather than travel.

Telecommunications and Planning

Much of the work of CSG was concerned with the role of Telecommunications in relocating office work from large urban areas, and in particular with the dispersal of government work from London. Several detailed studies of the communications requirements of government departments were undertaken and specific recommendations were made to government on the basis of these findings. Many of these studies are too specific to be of general interest, but the paper by Pye[10], gives an interesting general discussion of factors involved in relocation including the role of telecommunications, while Stapley (1973)[11], discusses the cost factors in dispersal of government work, using UK data.

Wider Implications of the Use of Telecommunications

More recent work at CSG has considered the use of telecommunications from the standpoint of its impact on existing patterns of communication in many fields of human interaction. These studies range from the possibility of working at home instead of commuting to city centres (Pye, 1974)[12], to an examination of the contribution of Cable Television in meeting the information needs of New Town residents (Davidson, 1975)[13].

The possible impact of telecommunications on the internal communication system of an organization, and methods of measuring this, are discussed by Ruth Tenne (1975)[14]; and on a macro-level, Elton (1975)[15] reviews the implications of telecommunications for the energy crisis.

In addition, the range of media studied by the group expanded to include advanced forms of information processing systems. Users' reactions to two such systems are reported by Hilary Thomas (1976)[16] and Emma Coope (1976)[17].

Recent research which will be of particular interest to participants in this conference has been done by the use of the telephone for teaching purposes in the Open University. The results of the pilot study were reported at last year's Wisconsin conference by Sue Holloway and Sandy Hammond, and a further grant has been received from the Social Science Research Council to continue this research in 1977.

Main Findings of the Research

It would undoubtedly be a major tour de force to summarize all the conclusions of the CSG research in a few pages. Although there were certain underlying themes, each researcher had his or her own approach, and area of interest, so almost every CGS paper has some conclusions which are not elsewhere repeated. Some of the studies were relatively isolated, in that the study and its conclusions stand alone, and cannot easily be integrated with the rest of the research.

However there are some underlying themes which were treated in sufficiently many studies that an integration of the findings is useful here. The findings will be listed in the same order as the main research areas discussed above, starting with those relating to studies of the effectiveness of telecommunications media for various communications tasks:

A) Tasks which are low on interpersonal involvement are relatively insensitive to the use of audio or video teleconferencing instead of face-to-face. Such tasks are information transmission, problem solving, and generation of ideas, where the relationship between the people involved is not a critical factor, and medium, which seems to have an effect on this relationship between the people involved is not a critical factor, and medium, which seems to have an effect on this relationship, has no great influence on the task outcome.

B) Tasks which are high on interpersonal involvement are sensitive to the use of teleconferencing instead of face-to-face. Such tasks are negotiation, conflicts of opinion, and getting to know someone. Here the relationship between the people involved is important, and medium of communication, which alters this relationship, affects the task outcome. This effect is usually such that there is a qualitatively different outcome (i.e. it doesn't just take longer to reach the same outcome) and in some cases it could be argued that the "best" outcome is obtained by teleconferencing, not face-to-face.

C) Medium of communication seems to have effects upon group structure. Leadership and coalition formation have both been shown to be affected.

D) Speech processes and speech content are affected by medium of communication, though these effects are not those that would be expected according to a simplistic hypothesis based on the known functions of visual nonverbal cues.

E) Most users prefer video to audio conferencing, though they feel that video is less private. This preference is a "gut-reaction": video just seems more interesting and appealing.

F) Users perceive teleconferencing media to be more effective for impersonal tasks, less effective for personal ones. These results parallel those from the task-outcome experiment (conclusions A+B).

G) Users do not perceive video teleconferencing to be much more effective than audio. Only for those tasks where both are perceived to be relatively unsatisfactory, is video perceived as distinctly better than audio.

H) The amount of communication generated by a department or other block of work can be predicted from knowledge of the type of work, number and seniority of staff and flow by other communications media. However, such predictions are not 100% accurate, and could not be used for the provision of telecommunications except on an initial basis, which would then be modified by feedback on congestion levels.

I) Communication audits can be relatively accurate, once certain biases are corrected for. These can provide essential information on the types of communications flows at present, which can be used to predict the utility of new media.

J) On the basis of meeting task alone, a majority of meetings could be transferred to telecommunications from face-to-face, primarily to audio-teleconferencing. This could be done without loss of effectiveness, as far as can be deduce from the psychological experiments. Video teleconferencing would be as effective as face-to-face, but more effective than audio, for only a small proportion of meetings.

K) Audio teleconferencing is nearly always cheaper than travel to face-to-face meetings, but this is less frequently so for video. The breakeven depends on distance separating the parties, the length of the meeting, the number of people who would travel, and the assumed cost of time wasted in travel.

L) Including data on comparative costs, and document requirements, audio teleconferencing could replace face-to-face for about 40% of meetings. Video teleconferencing could replace face-to-face for another 5% of meetings.

M) Cost comparisons of telephone exchanges with and without various advanced telephone facilities suggests that the savings are insufficient to pay for the additional recurrent costs, let along the additional capital costs. Naturally, the additional costs of exchanges with such facilities may decrease in the future, making them a more attractive proposition.

N) Task, level of acquaintance and travel time are all more important than the particular medium in influencing choice to telecommunication or travel.

O) Advanced telephone facilities are not greatly appreciated by potential users. Some of the facilities are rarely or never used, and only a small minority of users would consider paying for anything more than "keying" on their home telephones.

P) The substitution of telecommunication for travel is unlikely to encourage decentralization out of central London further than the southeast of Britain at present costs. Regional incentives provided by the government are insufficient to make longer moves cost attractive.

Q) It is frequently possible to save 10% or more of an organization's telecommunications costs by the careful use of private wires. These savings can only be achieved if the nature of the traffic flows can be predicted accurately: this normally requires telephone traffic surveys.

R) Widespread use of telecommunications could make neighborhood work centres attractive. However, for most office work, working from home is not a cost-effective alternative in the near or medium-term future.

S) The wider use of telecommunications has a potential for energy saving of 1 or 2% of total energy use. This could be achieved by substitution of telecommunications for travel, and by greater efficiency of travel (less wasted trips) achieved through the judicious use of telecommunications.

T) Telecommunications have considerable applicability to education and to medicine. In both cases, visual material will often need to be transmitted, but this need not necessitate a full video link.

U) On-line terminals for routine office work are generally appreciated by users. The computer power in such word-processing systems can lead to increases in typist's productivity, without and deleterious social consequences.

The evidence supporting these conclusions can be found in individual research reports. In many cases, there is some element of doubt about the conclusions, since either the data base is incomplete, or insufficiently rigorous methods were all that was possible, or one is trying to prove "no difference" so that new evidence may always overturn the conclusion. However, the authors, who take sole responsibility for this interpretation of CSG results, feel that the weight of the evidence is firmly in favor of these conclusions.

Most research in British Universities is finances on short-term grants, and it is unusual for a group such as CSG to have survived for 7 years without running into severe financial difficulties. This comparative success was largely due to the dearth of knowlege about telecommunications when the group began, and even now it is evident that large gaps in knowledge about telecommunications when the group began, and even now it is evident that large gaps in knowledge still remain. Its success was also due in large measure to the practical usefulness of the research to large organizations interested (very wisely) in the use of telecommunications for efficiency and cost-reduction. We hope that this awareness of the potential benefits of telecommunications will spread to other fields such as social services and education (in its widest sense) where research is still in its early stages.

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* A full list of the reports of the CSG, together with addresses from where they may now be obtained, is available from Sandy Hammond, University College, 22 Gordon Street, London WI.

A SURVEY OF TELECONFERENCING STUDIES IN THE PUBLIC SERVICE COMMISSION

Nicole Mendenhall and Michael Ryan
Public Service Commission
Ottawa, Canada

Abstract

This report presents a survey of the teleconferencing studies which have taken place within the Staff Development Branch of the Public Service Commission during the last three years. Results of the studies discussed indicate that teleconferencing can be used effectively as a training delivery system and as an administrative communication medium.

The Public Service Employment Act states that "The Public Service Commission (PSC) shall provide staff training and development for federal employees and shall help departments with their own programs." (Public Service Commission Annual Report, 1975).

It is the Staff Development Branch (SDB) of the PSC that assumes the primary responsibility for providing professional, linguistic, and managerial training. Every year more than 20,000 civil servants, located throughout Canada, attend these courses. In order to serve Canadian civil servants more effectively, the SDB is decentralized into twelve regional locations spanning the country. Yellowknife, a recently added northern regional location, is called upon to provide Indian and Inuit civil servants with the same training opportunities.

It has been observed that this decentralization imposes administrative and economic constraints. On the one hand, administrative tasks which involve the co-ordination of information, projects, budgets, or decision-making and imply a need for immediate access to information and resources are affected by decentralization. On the other hand, economic constraints are calculated in terms mostly of the cost of travel, lodging and lost time.

It is in attempting to solve decentralization constraints that SDB turned to teleconferencing as an alternative means of communication. In early 1974, researchers proposed to investigate the possibility of using teleconference for administrative and educational purposes. Both technical and socio-psychological variables were to be examined and a body of knowledge acquired so as to permit appropriate decisions to be taken.

Thus, a needs study analysis for a teleconferencing system was conducted among key managers in SDB. Responses indicated that communication needs existed mainly between headquarters and the regions rather than among the various of the country. It was also felt than an intra-city teleconferencing network would be needed to link the seven dispersed offices located in the National Capital.

The study showed that 8% of all meetings could be substituted by teleconference. The introduction of teleconference in 1974 would have represented an economy of $40,000. in travelling and lodging costs. (Barker 1975).

Field Studies

To investigate educational teleconference applications, two experimental sessions were undertaken: a financial seminar and a language teacher training seminar. Both field trials utilized the Bell Canada Video Conferencing System offering complete audio-video facilities between two locations. The Financial Seminar designed for SDB personnel consisted of a one-day session on "Services Contracts within SDB". These three one-day sessions held on consecutive days had respectively 6, 8 & 9 participants. The teaching methodology used was content presentation followed by dialogue with participants. Results obtained indicated that:

a) the content and the methodology were both suited to the technology,

b) the degree of satisfaction was inversely proportional to the amount of knowledge prior to the educational session, and

c) one-day training activities were found to be better suited for teleconferencing than face-to-face.

According to the participants, the following differences were observed when they compared teleconference to face-to-face. They felt teleconferencing was more businesslike and more serious; and that it inhibited agressivity and imposed a greater feeling of constraint (Lortie, 1975).

The second field experimental session, the training of language teachers in a new French language teaching methodology, also took place between two locations. Similar technical arrangements were made available by Bell Canada. Six specialists of Dialogue Canada (II) participated from Ottawa with 14 language teachers from Montreal. These were divided into sub-groups with seven language teachers and three to four specialists. The session consisted of two half-days with actual teleconferencing time of about 2hrs 15 min. per half-day session. The first session content was a review of Dialogue Canada I (DC I) while the second session was an introduction to Dialogue Canada II (DC II). Thirty minutes of theory was spent on DC I while the remaining time was for discussion and questions. However, for DC II only twenty minutes of formal presentation would take place and subsequent time would be left for discussion. Because of lack of available qualified specialists for DC I, only one of these sessions took place. On the whole, results obtained were similar to the Financial Seminar:

a) Methodology and content regarding DC II were found to be more suitable for teleconference than DC I. Content of DC I was perceived as being too vast for comparable time segment.

b) Communication was more content oriented and little interaction was possible within the same group. Participants felt that a face-to-face session would have been more lively, more intimate and less tense.

c) Participants of the first and second sessions felt that they had achieved their goals (Frenette, 1976).

Laboratory Studies

Consecutive with these field experiments were laboratory experiments conducted at the Carleton Place Public Service Training Center. These experiments in the Public Service Commission - Department of Communication Laboratory were aimed at studying: a) the potential of teleconferencing as a means of providing effective communication between dispersed government locations and b) the technical and behavioural advantages and disadvantages of using such systems. Most of the research undertaken were media comparison studies between 2-node audio, 2-node video and face-to-face. Participants were middle managers from various government departments attending managerial courses. The tasks performed were those that managers would normally be engaged in during their every day working activities, i.e., decision-making, tardy staff problems, brainstorming, etc. Since most of these studies have been reported and published, only a brief summary of the results will be provided:

Audio results

a) There is a tendency to react more negatively to audio teleconferencing. (Ryan and Craig 1975)

b) Audio meetings are found to be more tiring than face-to-face meetings (Mendenhall and Ryan 1975).

c) Participants were found to be more skeptical with respect to the content transmitted over audio (Mendenhall and Ryan 1975).

d) Audio meetings were found to be shorter than face-to-face meetings (Mendenhall and Ryan 1975).

e) Audio and face-to-face were perceived as being more private than video meetings (Ryan 1975).

Video results

a) Video teleconferencing and face-to-face conference media elicited more positive aestheticsm and evaluations reactions than the audio conferencing medium (Ryan 1976).

b) Video and audio media were perceived as more potent than face-to-face (Ryan 1976).

c) Participants evaluated video and face-to-face discussions more positively than audio discussion (Ryan 1977).

d) Face-to-face and video discussion were more active, potent and had a more positive atmosphere than audio discussion (Ryan 1977).

Face-to-face results

Face-to-face is perceived as being the most satisfactory medium for discussions (Ryan and Craig 1975).

Audio-only systems: two-node comparisons results

The following studies are comparisons of audio-only systems involving two locations.

The first study compared two open-microphone systems, the Ventura Set (commonly called the "earplug" system) and a loud-speaker system with two uni-directional microphones (see results a and b).

The second study involved the comparison of a voice-switching system, the Companion Set and an open-microphone system, the Stennheiser headsets see results c and d).

a) Making decisions was found to be more difficult and less effective over the Ventura Set than over the open microphone system. (Mendenhall and Jull 1975).

b) No significant difference was noted between the open-microphone and Ventura Set in the facility to express ideas and opinions (Mendenhall and Jull 1975).

c) Headset system was found to be more inconvenient and more difficult to adapt to than the Companion Set (Mendenhall and Rose 1975).

d) An individual voice sounded less articulate, reliable and natural over the Companion Set than over the headset (Mendenhall and Rose 1975).

Current laboratory research

Present laboratory studies are being conducted in preparation for the PSC satellite project to be held from April until June 1977. This tele-teaching project, based on a learner-centered andragogical model, will provide simultaneous interactive training to middle managers located in St. John's, Newfoundland, and Ottawa. The satellite will provide the link between four classrooms in St. John's with one classroom in Ottawa. These classrooms will be equipped with a fully interactive audio-video system and the St-John's - Ottawa link will feature a four-image-video multiplexing system.

The first of a series of laboratory studies in this project was aimed at exploring the use of teleconferencing in a four-node interactive, non-directive learning environment. Participants and the resource person decided, over three mediated sessions, what procedures would be used to teleconference effectively in a learning situation. The three sessions were evaluated in terms of the educational activity, the relationship among the nodes and feelings about the session. No significant group or main effects were observed over time. Participants did not come to a consensus on procedures until the third session at which time they implemented traditional classroom procedures: raising hands to speak (with teacher acknowledgment), self-identification, etc. (report forthcoming).

The second experiment, under analysis, was to determine the effect on learning in having a teacher-only node with three remote locations versus teacher with students.

The third and final study, to be analysed, consisted of simulating the PSC satellite experiment by applying a learning model, designed for mediated teaching situations, to a long-range planning course aimed at middle managers. Students were located in a four classroom interactive audio-video situation.

In summary, the results of these laboratory and field studies have shown that teleconferencing can be used to satisfy some of SDB's training and administrative needs. Second, these data have also shown that the technical aspect is an important variable to consider when choosing a teleconferencing system. Third, there are important socio-psychological variables that users should be aware of when using this communication medium, such as skepticism, fatigue, potency and perception. Fourth, this research has made us aware that we know little about the first order effects of this technology but even less about second order effects such as social change, and organizational impact. However, since the latter are difficult to anticipate except after a long period of usage, and since many fundamental questions still remain unanswered, future research should address these basic issues:

1. the optimum number of locations and number of students for effective learning in an interactive situation.
2. the type of methodology best suited for mediated learning.
3. the study of learning components, e.g. preparation, follow-up and their possible substitution by mediated communication.
4. the effect of media on learning processes, e.g. retention, attention, motivation, perception.

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THE INFLUENCE OF COMMUNICATION MEDIUM AND ROLE PLAYED STATUS LEVEL ON AGGRESSION, ANXIETY CONCENTRATION, ELATION AND SURGENCY*

by

Michael G. Ryan, Ph. D.
Head, PSC-CTS Satellite Project
Staff Development Branch
Public Service Commission
Ottawa

and

James F. C. Rose
The University of Manitoba
Winnipeg, Man.

Abstract

The mood of the user in different communication media could well affect the potential use to be made of the medium involved. If one medium has a much better mood rating, it could well be the better medium for communication. However, if the mood differences are minimal or nonexistant, the use of various media could be freely exchanged.

In this experiment the Nowlis 'Mood Adjective Check List' (MACL) (short form) (Nowlis, 1965) was the dependent measure. In this scale various adjectives are rated from one (low) to four (high). The various adjectives combine into 12 dimensions, five of which were examined in this experiment: aggression, anxiety, surgency, concentration, and elation. The first four are along one factor axis, and elation is included as it is related closely to surgency.

Three different intergroup communication media (audio, video (with audio), and face-to-face) were tested on two occasions with federal government executives at a management development course. On both occasions a control for 'status' was used. All individuals were placed in groups, and each group received all three different media but in different presentation orders.

Partial support was found for the information theory paradigm which predicted that more positive mood states would be achieved in wide channel media. This was found for surgency, $F(2,72)=3.34, p<.05$ and elation, $F(2,72)=4.38, p<.05$. A Newman Kuels Repeated Measures Analysis showed that video caused significantly more positive surgency reactions than did face-to-face while video caused significantly higher elation reactions than audio. However information theory did not fare well with the other three mood dimensions, as there was no statistical significance found that indicated any difference between media.

Other analysis showed one order effect for concentration, $F(2,36)=4.609, p<.05$, such that the face-to-face, audio, video order elicited significantly more concentration than the other orders. There was also a significant interaction effect with elation of medium and order $F(4,72)=2.84, p<.05$, however the Newman Kuels Repeated Measures Analysis did not 'pinpoint' the area(s) of significance due to the conservative nature of that test. There were no status main effects.

Intergroup telecommunication technologies allow geographically separated participants to take an active part in the same meeting or conference without involving extensive travel. Standard and augmented audio and video (with audio) systems are currently operating in many countries, including Canada, and the success or failure of these technological innovations depends greatly upon the users' reactions. This report, one of a series of reports from a major study, presents the influence of intergroup telecommunications media and status on several dimensions of mood: aggression, anxiety, concentration, surgency and elation.

The past half decade has witnessed increasing interest and activity directed towards the description and prediction of interpersonal and intergroup mediated communication behaviour. Some effort has been extended in attempts to compare audio and video teleconferences with face-to-face conferences (Ryan & Craig, 1975; Ryan & Mendenhall, 1975; Weston & Kristen, 1973; Weston, Kristen & O'Connon, 1975). Such was the aim of this study which addressed the following research question: "What influence does the mediated communication and status have on the aggression, anxiety, concentration, surgency and elation of participants?"

Nowlis (1965) defines 'mood' as the individual's general level of functioning and activation due to his own configuration of activity. As such, 'mood' might well influence the response to teleconferencing (Ryan &

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* This work was done at the Communications Research Center where M. Ryan was a Deputy Program Manager and J. Rose was a Research Associate

Craig, 1975), such that if the medium produces a positive mood state, the level of functioning and activity may be more productive and satisfying than if it produces a negative mood state. If, however, the medium produces a 'mood' state that is not different from face-to-face conferences, then they are at least equivalent in that regard.

Information theory provides one view to the 'moods' relating to communication media. The theory, in part, deals with the problems of information transmission over a 'noisy' communication channel and the changes needed to compensate for this loss. The capacity of the communication channel is a function of its bandwidth, decreasing from face-to-face through video (with audio) to audio conferencing. This bandwidth restriction is due to the limitation placed on the number of man's senses that can be employed. Winer & Mehrabian (1968) state that:

> *"It is hardly debatable that the greater the quantity and quality of sensory channels available in a communication link, the greater the information potentially put in, through and out of the system."*

While Hall (1966) goes on to state that:

> *"It follows that face-to-face human communication with its capability for engaging all of the senses, provides participants with the maximum quantity and diversity of sensory data."*

Finally, Weston & Kristen (1973) state that:

> *"Relative to face-to-face communication, technologically mediated communication degrades both the quality and the diversity of the raw memory data available in the system. In this sense, the more sensory channels that are unavailable in a mediated communication system, the less the variety of communication cues. Simply stated, the quality and diversity of data available for processing is greatest in face-to-face communication, less in video systems, and least in audio systems.*
>
> *To the extent that the richness of the available information base in conference situations is directly related to such things as mutual stimulation among the participants, greater awareness and appreciation of each other's intentions, reactions, and attitudes (see McGrath & Altman, 1966), it follows that the face-to-face conference mode will generally be most intensive and "audio only" teleconferencing the least intensive on a wide array of conference parameters."*

Thus, mood could be one of these factors that are effected by the richness of the conferencing situations, with higher positive moods indicating better conferences.

There has been little previous research on moods in mediated communication, except for that of Ryan & Craig (1975) and Ryan & Mendenhall (1975) who completed complementary reports in this series. Ryan & Craig (1975) found (1) there were mood differences among audio, video and face-to-face conferences; (2) there were no status differences among audio, video and face-to-face conferences in reference to mood; (3) face-to-face conferencing elicited more positive mood ratings than audio teleconferencing; (4) video teleconferencing elicited more favourable mood reactions than audio teleconferencing; (5) there was no mood differences between video and face-to-face conferencing. Ryan and Mendenhall (1975) found that participants were more skeptical in audio than in face-to-face. There was no media difference, however, for the following mood dimensions: sadness, social affection and fatigue.

PREDICTIONS & HYPOTHESES

The results of this experiment will probably show that the narrower the capacity of the system employed, the greater the negative mood dimensions obtained. Some of the possible reasons for this are: (1) the 'problem-solving task' might require more information than the narrower communication channels can provide; (2) intergroup telecommunication is a novel experience for most of the research participants; (3) few of the research participants have developed the communication behaviour redundancy techniques necessary to compensate for the higher entropy rates of the narrower bandwidths of teleconferencing. This would be consistent with the Ryan and Craig (1975) results and with some of the Ryan and Mendenhall (1975) findings.

METHOD

Subjects: The 51 subjects in this experiment were federal civil servants enroled at the Carleton Place Training Centre of the Canadian Public Service Commission just outside Ottawa. The experiment took place during two management development courses conducted by the Commission's Bureau of Staff Development and Training. The majority of the subjects were male middle level civil servants from numerous departments across Canada.

Design: A repeated measures replicated counterbalanced design was utilized for the study. One of the two status treatments characterized each replication and, within one replication, subgroups of subjects were exposed to three media conditions in counterbalanced order (see Table 1). Each of the two management training groups were randomly divided into two subgroups. One subgroup received a medium status induction and the other subgroup received a high status induction. Each status subgroup was further subdivided into three subgroups in a random fashion and proceeded through the study in one of three counterbalanced orders. Thus one subgroup in each status group was exposed to the audio, video, face-to-face order; one subgroup was exposed to the video, face-to-face, audio order; and the third subgroup was exposed to the face-to-face, audio, video order (see Table 1).

This design recommended itself due to two factors. First, it maximized the information provided by the small sample available. Second, it provided all the management trainees with experience with each communication medium. In each instance every attempt was made to assure random assignment to treatments.

Procedure. Subjects gathered for a briefing designed to introduce the study, to orient their behaviour, and to motivate them to participate. Response booklets were distributed in an envelope addressed to the subject with his or her name, group number, and subject number. The response booklet contained a letter of introduction, a time schedule, a conference task, and three sets of response sheets; one set for each of the communication conditions.*

The covering letter on the response booklet introduced teleconferencing and provided instructions for proceeding through the study. The second page offered a schedule indicating the movement of the subject's subgroup throughout the study. Each subject was a member of one of 12 subgroups. The schedule for subgroups one to six indicated an early afternoon experimental time slot and the schedule for subgroups seven to 12 indicated a late afternoon time slot.

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* Other materials covered other areas of the experiment reported elsewhere (Ryan and Craig, 1975; Ryan 1975: Ryan and Jull 1975, Ryan and Mendenhall, 1975)

The subgroups were paired and each pair formed a conferencing group ranging in size from three to five. Subgroups one, two, seven, and eight proceeded through the audio, video, face-to-face order; subgroups three, four, nine, and 10 proceeded through the video, face-to-face, audio order; and subgroups five, six, 11, and 12 proceeded through the face-to-face, audio, video order.

The task, entitled, "The Tardy Staff", emerged from the management course content. Subjects were asked to apply a problem solving analytical scheme to the case to come up with a solution to this personnel problem. In order to clarify the task, a second case was provided along with its sample analysis.

A four response option mood scale, Mood Adjective Check List (MACL) (short form) (Nowlis, 1965), was the dependent measure. The 'mood' groups examined here were: aggression, anxiety, concentration, surgency, and elation.

The subjects were instructed to complete the first scale after their first experimental condition; the second scale after their second experimental condition. The scales were coded by condition and number to assure that the subject would respond to the appropriate set of dependent measures.

Upon completion of the experiment, subjects returned to the briefing room for debriefing with their completed response booklets. Debriefing involved the description of the experimental purposes and procedures as well as the elicitation of the participants' reactions to communication media.

VARIABLES

This study measured the influence of the communication media and status on some dimensions of the participants' mood. The Nowlis (1965) MACL was used in this study. The MACL factors were combined into 12 dimensions and aggression, anxiety, surgency and concentration cluster along one axis. Elation was included for this report as it related closely to surgency.

The MACL requests the subjects to react to a mood term with one of four levels which were: (1) definite agreement, (2) slight agreement, (3) cannot decide, (4) definite disagreement. Coding ranged from negative to positive such that a response at the positive pole received a score of one and a response at the negative pole received a score of four.

DEPENDENT VARIABLES

Nowlis (1965) gives an outline description of each of the various mood factors analyzed, and the following are abbreviated explanations:

Aggression. This factor appears in all 15 of the factor analytic studies listed in Nowlis (1965). Adjectives include defiant, rebellious, angry, grouchy, annoyed and fed-up.

Anxiety. This factor, in some form also appears in all the 15 factor analytic studies listed in Nowlis (1965). The best adjectives were clutched up, fearful and jittery; also, startled and schocked appeared quite frequently on this axis.

Concentration. This factor was not directly anticipated by Nowlis (1965), but appeared in all of the replicative studies (Nowlis, 1965). There appears to be two allied dispositions; the first being reflective: careful, contemplative and introspective; and the second being positively valued and socially responsible mood of involvement: clear-thinking, decisive, efficient, attentive, earnest and serious. There is also a third cluster that appears to correlate with both of the dispositions: concentrating, engaged in thought and intent; and this third cluster has the most consistently high loadings in this factor. The central idea of the factor seems to be involvement with one's thought or one's task or both.

Surgency. This factor is closely related to the factor elation; also with nonchalance, and sometimes with social affection. This factor has not been thoroughly tested in replicative studies. The best adjectives are: carefree, playful, witty, lively and talkative.

Elation. This factor, like surgency, was not clearly discriminated immediately because of its close ties with the surgency factor. The best adjectives are: elated, over-joyed, pleased, and refreshed, plus lighthearted.

INDEPENDENT VARIABLE

Status. Status refers to the relative prestige of individuals in the group. Education, social class, finances, power or leadership behaviour can contribute to the status of group members. In this study, status was operationalized by means of a status induction before the administration of the treatments. Groups in the high status induction were asked to adopt the role of senior executives for the duration of the study; demonstrating the additudes, points of view, and behaviours characteristic of this governmental group. The medium status group were asked to play a middle level government role such as that of a director.

ANALYSIS

A two by three by three repeated measures analysis of variance for status, media and order was carried out on the data for each of the dependent variables. Repeated measures argue for conservatism in analysis and, consequently, Newman-Jeuls repeated measures techniques were used for testing both the directional predictions as well as for post hoc analysis (Winer, 1962, p. 309). Only 42 of the 52 subjects in the sample were included in analysis due to the fact that the analysis package used could only treat equal size groups. The 0.05 level of significance was used in all interpretation of the data.

RESULTS

The statistical analysis of the data revealed a media main effect for surgency, $F(2,72)=3.34, p<.05$ (see Table 4 and Fig. 1); and elation, $F(2,72)=4.38, p<.05$ (see table 5 and Fig. 1). Video caused significantly more positive surgency reactions than did face-to-face (Table 9) while video caused significantly higher elation reactions than audio (Table 8). There was one order effect for concentration, $F(2,36)=4.609, p<.05$ (see

Tables 6 & 7 and Fig. 2), such that the face-to-face, audio, video order elicited significantly more concentration than the video, face-to-face audio order and the audio, video, face-to-face order. Also, there was a significant order interaction effect with elation for medium and order, $F(4.72)=2.84, p<.05$ (see Table 5 and Fig. 3); however, the level of significance was so marginal that the more conservative Newman Kuels test did not 'pinpoint' the difference (see Table 10). There was no significant media main effect for aggression, anxiety or concentration. Tables 2 and 3 show the lack of significance for aggression and anxiety.

DISCUSSION

The results of this study provide partial support for the information theory paradigm which generated the predictions that participants would experience more positive mood states in the wide channel face-to-face and video contexts than in the more narrow channel audio context. The analysis showed that, for elation, the video was significantly different from the audio, with video as the highest and audio as the lowest; while for surgency, the test showed that face-to-face was significantly different from video with video again being the highest while face-to-face was now the lowest.

These tendencies are consistent with the media main effects on mood reported by Ryan and Craig (1975) and with the skepticism results of the Ryan and Mendenhall (1975) findings. However, the high positive peak of 'moods' with video medium may be due to the novelty of the situation, as the subjects may now interact by means of what was previously a one-way communication device. However, this novelty and the newness of the situation will wear off in time, and may cause the loss of any significant difference between the media studied.

Information theory as a generating paradigm fared more poorly, however, in predicting the results of the remaining three dimensions of mood reported above. Contrary to the predictions of information theory, there were no significant media effects for aggression, anxiety and concentration. Likewise, there were no media main effects for social affection, sadness and fatigue in the Ryan and Mendenhall (1975) report.

Some reasons might be advanced for the mixed nature of the results of the present study. One might argue that the repeated measures nature of the research design mitigated against large between media differences. Moreover, the short periods of exposure to each media condition may have not provided enough time to establish an identifiable mood state.

This study, as Ryan & Craig (1975), showed no status differences even when each of the five 'moods' were examined separately. However, it would have been better to use subjects truly belonging to the groups rather than those 'acting' that position.

There was an order effect for the concentration 'mood', with a significant peak on the face-to-face, audio, video order. However, great weight should not be placed on this result as order was not found to be significant when all 'moods' were examined (Ryan & Craig, 1975). It is unfortunate that all six different combinations of the three systems were not employed to see more clearly the nature of this effect, but the limited size of the available population made this impossible.

Finally, there was an interaction effect of media and order; however, the Newman Kuels Repeated Measures Analysis did not 'pinpoint' the exact point(s) of significance due to the conservative nature of the test and the small level of significance. One may, thus, conclude that the effect is of minimal importance and relevance.

In conclusion, it would seem appropriate to state that the audio channel of intergroup communication will only affect elation and surgency and not social affection, sadness and fatigue levels of the participants. It is also recommended that more research be conducted in the area of intergroup interaction over various systems and over varying time frames.

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Table 1

The Research Design

Replication 1

	audio	video	face-to-face
High Status	video	face-to-face	audio
	face-to-face	audio	video
	audio	video	face-to-face
Medium Status	video	face-to-face	audio
	face-to-face	audio	video

Replication 2

	audio	video	face-to-face
High Status	video	face-to-face	audio
	face-to-face	audio	video
	audio	video	face-to-face
Medium Status	video	face-to-face	audio
	face-to-face	audio	video

Table 2

Aggression
Analysis of Variance

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	P
Between	36	8.402897	.233413		
Order	2	.968254	.484127	2.074	-
Status	1	.295317	.295317	1.265	-
Order x status	2	.353016	.176508	.756	-
Within	72	6.734286	.093532		
Medium.	2	.212540	.106270	1.136	-
Medium x order	4	.631746	.157937	1.689	-
Medium x status	2	.091587	.045794	.490	-
Med. x stat. x ord.	4	.496508	.124127	1.327	-
Total	125	18.186111	.145489		

Table 3

Anxiety

Analysis of Variance

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	p
Between	36	16.262857	.451746		
Order	2	1.852857	.926429	2.051	-
Status	1	1.105079	1.105079	2.446	-
Order x status	2	.360159	.180079	.399	-
Within	72	7.240000	.100556		
Medium	2	.606190	.303095	3.014	
Medium x order	4	.758095	.189524	1.885	-
Medium x status	2	.264921	.132460	1.317	-
Med x stat x ord	4	.524127	.131032	1.303	-
Total	125	28.974286	.231794		

Table 4

Surgency

Analysis of Variance

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	p
Between	36	33.597143	.933254		
Order	2	.007778	.003889	.004	-
Status	1	.153651	.153651	.165	-
Order x status	2	.825873	.412937	.442	-
Within	72	14.200000	.423022		
Medium	2	1.317302	.658651	3.340	<.05
Medium x order	4	.576984	.144246	.731	-
Medium x status	2	.583968	.291984	1.480	-
Med. x stat. x ord.	4	1.615079	.403770	2.047	
Total	125	52.877778	.423022		

Table 5

Elation

Analysis of Variance

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	p
Between	36	35.156190	.976561		
Order	2	.545873	.272937	.279	-
Status	1	.002857	.002857	.003	-
Order x status	2	.823333	.411667	.422	-
Within	72	15.572381	.216283		
Medium	2	1.897778	.948889	4.387	<.05
Medium x order	4	2.457937	.614484	2.841	<.05
Medium x status	2	.144762	.072381	.335	-
Med x stat x ord	4	.140476	.035119	.162	-
Total	125	56.741587	.453933		

Table 6

Concentration

Analysis of Variance

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	p
Between	36	32.565714	.904603		
Order	2	8.337778	4.168889	4.609 <	>.05
Status	1	.520714	.520714	.576	-
Order x status	2	.325714	.162857	.180	-
Within	72	13.277143	.184405		
Medium	2	.991111	.495556	2.687	-
Medium x order	4	.819841	.204960	1.1111	-
Medium x status	2	.144762	.072381	.393	-
Med x stat x ord	4	.373810	.093452	.507	-
Total	125	57.356587	.458853		

Table 7

Concentration

Newman Kuels Repeated Measures Analysis

Order	VFA	AVF	FAV	Shortest Significant Range
VFA	-	.1333	.6 *	$R_2 = .415$
AVF	-	-	.4667 *	$R_3 = .499$

* = significant .05

Table 8

Elation

Newman Kuels Repeated Measures Analysis

Medium	Face-to-Face	Audio	Video	Shortest Significant Range
face-to-face	-	.1667	.1333	$R_2 = .203$
audio	-	-	.3 *	$R_3 = .244$

* = significant .05

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Table 9

Surgency

Newman Kuels Repeated Measures Analysis

Medium	Face-to-Face	Audio	Video	Shortest Significant Range
face-to-face	-	.11	.25*	R_2 - .19
audio	-	-	.14	R_3 - .23

* - significant .05

Table 10

Elation

Newman Kuels Repeated Measures Analysis

Order	F	A	A	V	A	F	F	V	V	Shortest Significant Range
FAV	-	.01	.04	.10	.16	.31	.40	.46	.55	R_2 = .56
VFA	-	-	.03	.09	.16	.30	.39	.45	.54	R_3 = .55
AVF	-	-	-	.06	.13	.27	.36	.42	.51	R_4 = .53
VFA	-	-	-	-	.06	.21	.30	.36	.45	R_5 = .51
FAV	-	-	-	-	-	.14	.24	.29	.39	R_6 = .48
VFA	-	-	-	-	-	-	.09	.15	.24	R_7 = .46
AVF	-	-	-	-	-	-	-	.06	.15	R_8 = .42
AVF	-	-	-	-	-	-	-	-	.09	R_9 = .35

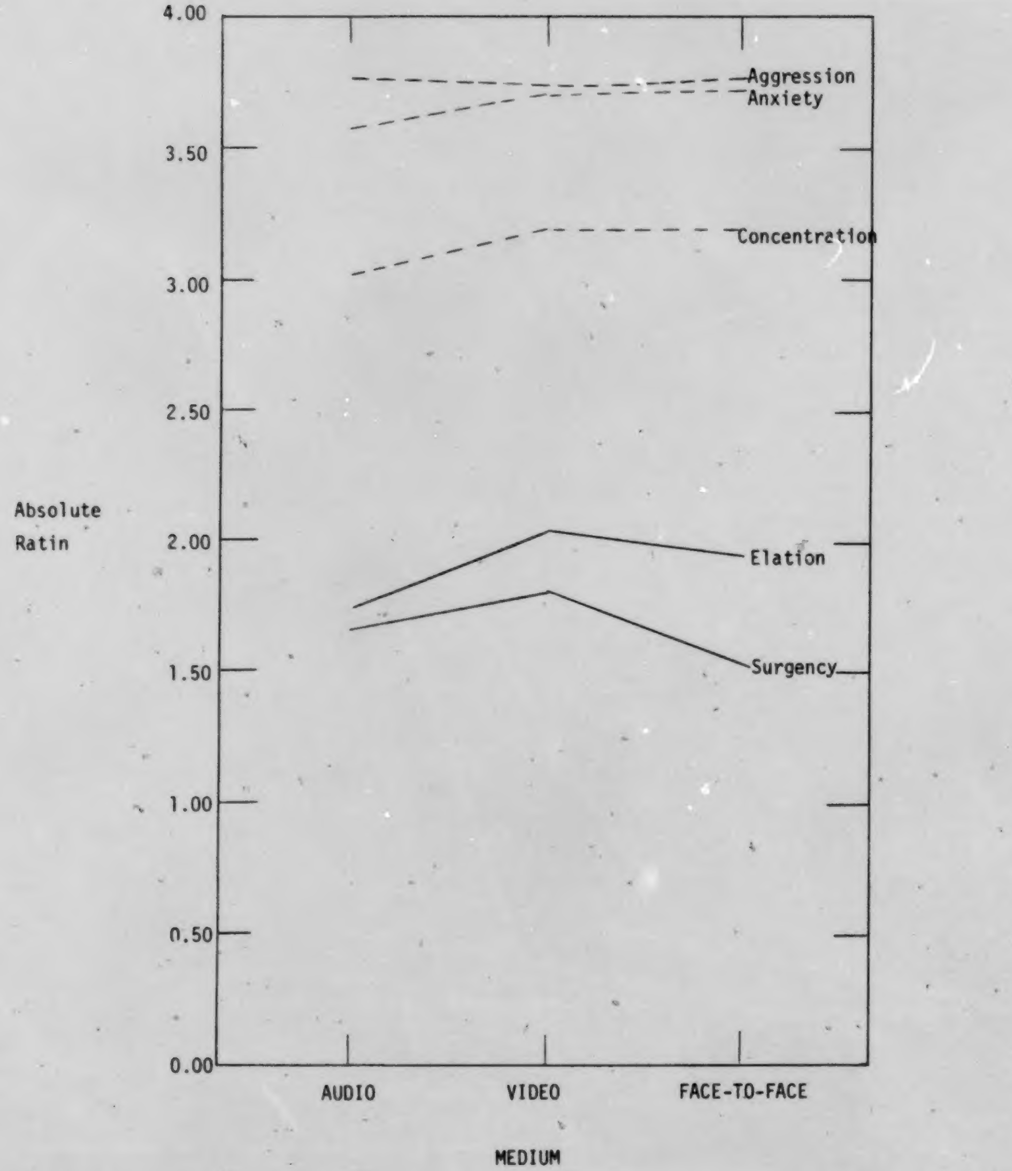

FIGURE 1

MOOD LEVELS AS A FUNCTION OF MEDIA

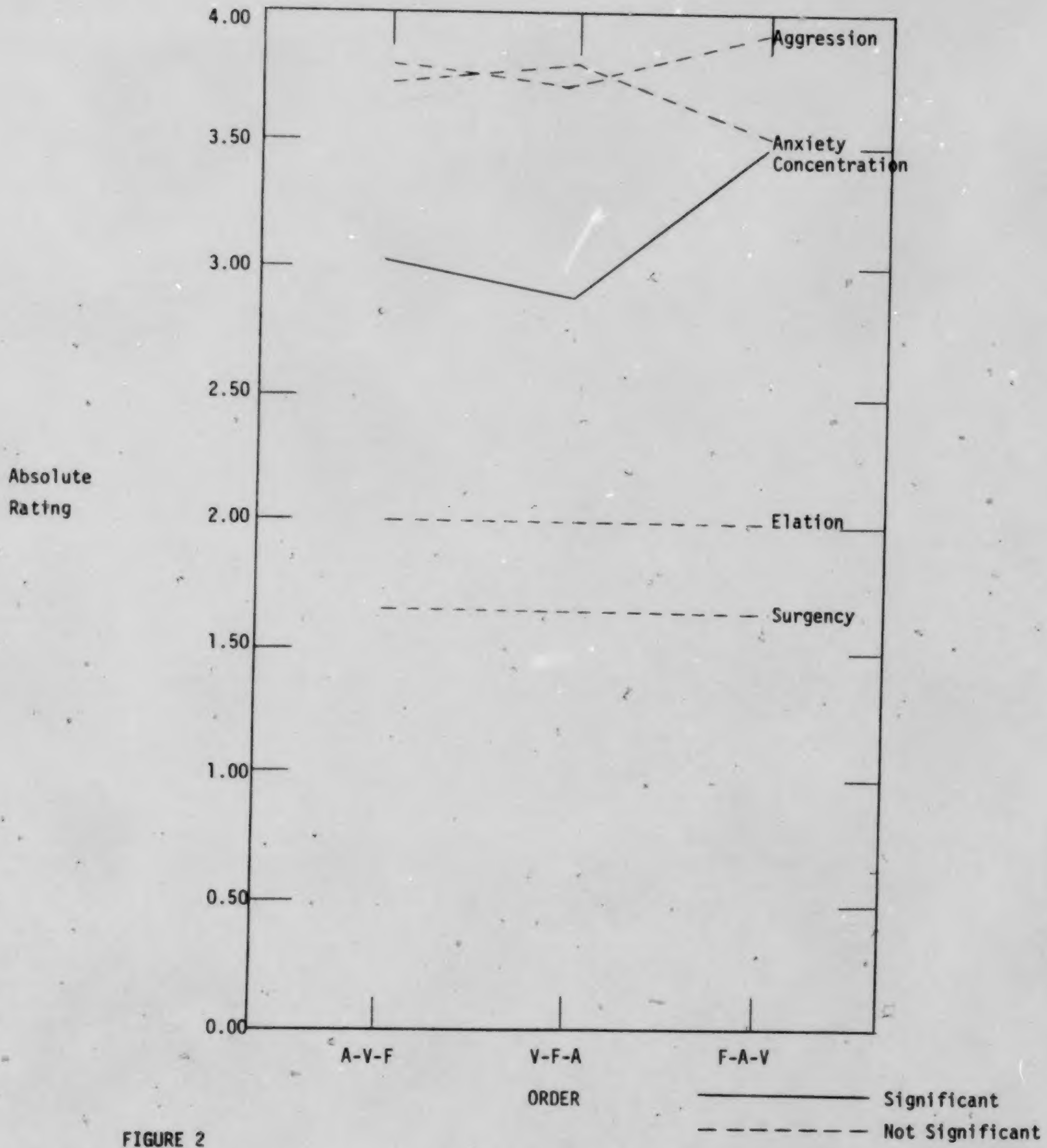

FIGURE 2

MOOD LEVEL AS A FUNCTION OF ORDER OF
PRESENTATION OF MEDIA

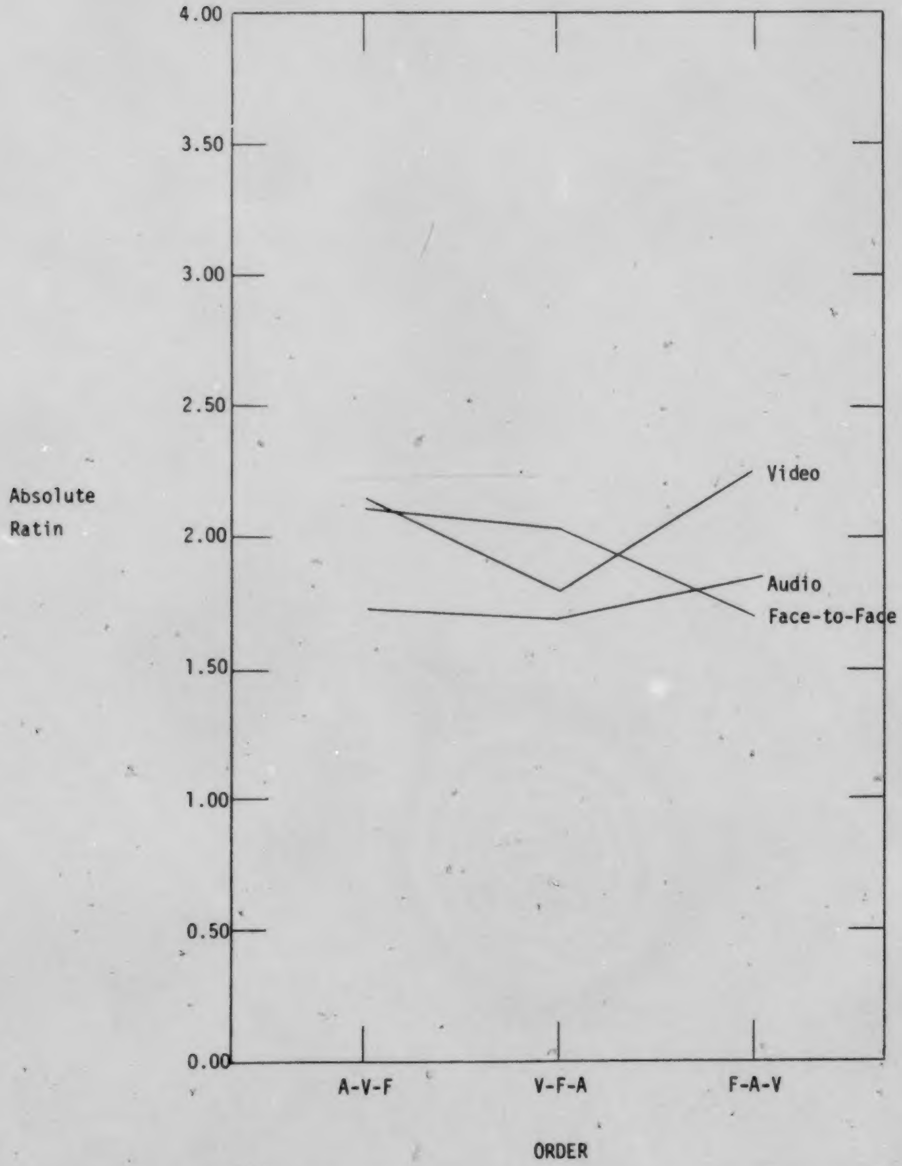

FIGURE 3

ELATION & MOOD LEVEL INTERACTION EFFECT AS
A FUNCTION OF ORDER OF PRESENTATION OF
MEDIA

PROJECT REPORT: EDUCATIONAL EXPERIMENTS IN CANADA WITH THE COMMUNICATIONS TECHNOLOGY SATELLITE (CTS)

By John S. Daniel, Michèle L. Côté, Télé-université, Québec
and Murray Richmond, Athabasca University, Edmonton, Alberta

1. INTRODUCTION: AN EXPERIMENTAL SATELLITE PROGRAMME

Made in Canada and launched by the U.S. on January 17th 1976, the Communications Technology Satellite is a joint venture between the two countries. Intended as an experimental rather than an operational satellite its novel features are firstly high power (200w) and secondly the frequency at which it receives and emits (12-14 GHz). High power in the satellite means that smaller and cheaper ground terminals can be used, whereas communicating at a high frequency part of the radio spectrum means less congestion and less interference with terrestrial facilities. In concrete terms this means that terminals can be placed in cities (e.g. on the roofs of buildings).

The objectives of the Canadian Department of Communications in the CTS project were stated as:

1) To enhance in Canada a capability in the design and manufacture of spacecraft subsystems for domestic use and export.

2) To maintain a Canadian capability to specify, assess and construct space application systems for domestic use.

3) To develop and flight test spacecraft subsystems and components for use in future communications satellites.

4) To conduct communications experiments to explore the use of future high-power communications satellites in Canada to low cost ground stations in the 12 and 14 GHz bands.

5) To explore by means of communications experiments the social, cultural and economic impact of the eventual introduction of services that might be provided.

Clearly the CTS project was justified to the Canadian government principally on the basis of the technical developments and experiments which it would permit. Important components of the experiments were the study of the attenuation of 12-14 GHz signals under different weather conditions and of the use of wave polarization to increase channel capacity. However, these and other technical experiments required relatively little satellite time because of a growing realization that communications satellites were not an end in themselves, the government invited institutions and organizations across the country to propose experiments in social communications to be carried out on CTS. About forty proposals were studied in the areas of education, telemedecine and social interaction. The present article is limited to the educational experiments which have been carried out in Canada since the satellite was launched.

2. THE EDUCATIONAL EXPERIMENTS

Two institutions, Carleton University (Ottawa) and the University of Quebec carried out experiments between the summer of 1976 and the spring of 1977. Two other projects, those of Memorial University (Newfoundland) and the Federal Public Service Commission, will begin in Spring 1977. We shall describe the aims and configurations of each of these four projects and then offer evaluative observations on the experiments which are almost completed.

2.1 The Carleton-Stanford curriculum exchange

This project combines both technical and educational objectives. The basic aim is to use the satellite to allow students at Stanford University in California to take courses originating in Ottawa and vice versa. In one mode one class is simultaneously originated at each end and communications to the remote students are provided by means of one way video and two way audio. In the other mode two way video is used to enable a fuller interaction between the ends of the link. In addition to satellite technology the exchange uses experimental methods of television signal processing. These digital processing methods which permitted transmission of video signals from 2m. terminals, were developed by the NASA Ames Research Centre, a partner in the project. In simple terms they doubled the capacity of the video channel.

The first course exchanges began on October 19th 1976 and for the rest of the term five courses were available at both universities. These were:

Originating University	Course Title	Hours per week	Number of students	
			Carleton	Stanford
Carleton	Digital Systems Architecture	3	25	5
Carleton	Computer Communications Systems	3	30	15
Stanford	Management of Research Institutions	2	20	30
Stanford	Statistical Methods in Signal Analysis	3	6	20
Stanford	Seminar course	1	Variable	

In the winter term only one course was offered in each direction although there are plans for additional seminars at the time of writing.

2.2 The University of Quebec Omnibus Network

The only multi-campus university in Canada, the University of Quebec already had experience of satellites through its involvement in France/Quebec exchanges in the Comminsat Frabec and Symphonie programmes. The University's CTS proposal differed from those submitted by other institutions in that the content of the experiment was purposely left undefined. The satellite would be used to create a communications network between the campuses and local centres of the university and the whole university community would be invited to submit projects. Of the thirty experiments submitted fifteen were carried into the planning stage and the nine experiments of which descriptions follow have been conducted.

2.2.1 Electron microscopy

An interactive research discussion between bacteriologists in Montreal, Quebec and Trois-Rivières. The other sites received live images from an electron microscope in Montreal and discussion centred on identifying viruses and bacteria. Videotapes, reprints etc. could be called up at will and the electron microscope adjusted in real time to provide the field and magnification requested by the distant participants.

2.2.2 Teledocumentation

Since library services pose a problem for off campus courses the satellite was combined with rapid facsimile transmission equipment to make documents available for students in a Business Management course organised by the Rimouski campus in the towns of Hauterive and Chandler. Students use the audio link to discuss their needs with the Rimouski librarian who sends out the appropriate texts by rapid facsimile transmitter through the satellite.

2.2.3 Telereference

Although somewhat similar to 'Teledocumentation' this project, which involved the University's libraries in Rimouski and Trois-Rivières, included a one way video link. Students in Rimouski could see the reference librarian in Trois-Rivières to whom they explained their needs. The video link was also used to show tables of contents, abstracts etc. to help the student zero in on the most appropriate reference text. The chosen text was then transmitted by satellite using the rapid facsimile equipment.

2.2.4 Center for the Development of Learning Environments (CDES)

At any given time the CDES is involved in innovative projects with teachers in a number of schools around the province. The satellite was used (one way video - two way audio) for consultation between CDES staff and teachers in the Quebec City area. The objective was to study the effect of a consultation where each participant is in his everyday milieu. The traditional form of consultation implies that each participant is either visited or a visitor and it was hypothesized that this influences the consultative interaction.

2.2.5 Graduate course in public administration

One of the only classical teleteaching projects carried out in Quebec this experiment brought three sessions of a masters course from the University's Graduate School of Public Administration in Quebec City to students in Hull. The one way video link from Quebec to Hull was used to transmit images of the instructor and his transparencies etc. and discussion took place over the two way audio link. The objective was to study the changes in behaviour which such an arrangement both requires and provokes on the part of both the instructor and the students.

2.2.6 Radio Orbital

An ambitious project to link the Magdalen Islands with emigré islander communities in Montreal and Chicoutimi for a Christmas communications jamboree, this experiment unfortunately fell foul of numerous technical problems. One multipoint radio session took place over landlines but the more intimate telephone sessions had to be abandoned.

2.2.7 Oceanology

This was a technical experiment to use the satellite for transmitting oceanographic data on wave heights, conductivity, salinity, temperature (and gradients), depth and turbidity from the probes to the computer.

2.2.8 Western Quebec

The University's centre in Western Quebec, CEUOQ, serves a sparsely populated area of 200,000 square miles. Already involved in various teleteaching and telemanagement projects, the CEUOQ is using some 50 hours of satellite time for telework sessions, teleconferences, and a telelecture course. Some seven sites are involved.

2.2.9 Intercom

Scheduled for the end of the University's experimental period, this project aims to link community radio and TV between two regions. The objective is to determine whether such a link fosters exchanges between communities or whether such exchanges require personal contacts on a day to day basis.

2.3 Memorial University

Starting in March 1977, this project links St. John's with Stephenville, St. Anthony, Goose Bay - Happy valley and Labrador City. The satellite will be used for four types of activity.

- Continuing medical education for physicians.
- Continuing nursing education.
- Community health education.
- Consultation services and transmission of medical data.

2.4 The Public Service Commission

This experiment has both technical and educational objectives. Four groups in St. John's are linked with Ottawa for a course in long range planning. Using a multiplexing technique developed by Miller Communications Systems Ltd, the TV images from the rooms in St. Johns are sent to Ottawa over a single video channel. From an educational point of view interest centres on the non-directive mediated learning model which is to be used in the course. This experiment will run from April through June 1977.

3. EVALUATING THE EXPERIMENTS

Individual experimenters are responsible for evaluating their projects and the present authors have been charged with conducting an overall assessment of the CTS educational experiments with a view to developing models for the future use of satellites in Canadian education. An overall evaluation plan (1) based on Stufflebeam's Context-Input-Process-Product model has been submitted to experimenters along with a series of standard questionnaires covering the following aspects of the experiments.

- Technical and interactive aspects (participants and site coordinators).
- Participant satisfaction.
- Project staff data.
- Interview checklists for experimenters, instructors, facilitators and participants.

These questionnaires are either used as provided or modified to increase their relevance to a particular experiment. The experimenters are the first to compile and interpret the data and this process is currently under way. For this reason the evaluative observations we make in the following paragraphs are based on observation of sessions and interviews with experimenters rather than on data gathered through our instruments.

4. THE LESSONS LEARNT TO DATE

Before commenting on the results of the CTS projects, it is worth emphasizing that there are important differences in context between the Canadian CTS experiments and most previous demonstration applications of satellites in the U.S. (e.g. the ATS 6 projets). Whereas the U.S. educational projets on satellites are generously, not to say excessively, funded with 'fresh, federal money the CTS educational experiments in Canada have been very much a shoestring operation. Every institution participating has been obliged to put significant resources into its experiment. Similar remarks apply to the evaluation of the experiments which has involved large numbers of people on an overload basis as well as the present team. The total evaluation budget to date is comparable to the sort of grant given for the preparation of a Research Funding Proposal in the U.S.

These remarks are not intended in a spirit of complaint. On the contrary, we beleive that the benefits of the project would have been fewer had it been seen by institutions as a generously funded tack-on to their 'real' activities. Hooper (2) has pointed out that overdependence on external funds is a positive hindrance to the assimilation of educational technology. In a similar vein we believe that the diffuse manner in which evaluation has been carried out has advantages which outweigh any lack of consistency inherent in such a procedure. With these provisos we shall comment briefly on various aspects of the experiments.

4.1 Organization

Nearly all those involved in CTS have run into organizational difficulties. The Carleton-Stanford experiment has reveated that everyday problems like mail delays, timetabling, ordering set books, checking equipment take on critical importance in a project involving more than one institution. The University of Quebec discovered that a nice organizational chart derived from the structure of the institution had to be scapped in favour of a more streamlined and progmatic working arrangement once the project got under way. It seems that a significant proportion of satellite time should be set aside for project administration and any chances to simulate the experiments on other facilities beforehand should be taken.

4.2 Length of experiments

Although the original mixture of projects carried out at the University of Quebec constitutes one of the major points of interest in Canada's CTS activities we feel that each project was condensed into too short a period and often not given enough time. Since nearly all projects suffered a few technical hitches at the start it seemed that just when they were beginning to hit their stride time was up.

4.3 Content

The University of Quebec experiment has shown that satellites can be used in education for many other activities besides telelectures. Both the research discussion (electron microscopy) and library (teledocumentation, telereference) experiments indicate promising fields for the future.

4.4 Multipoint conferencing

Perhaps because they were too used to the traditional communication patterns of broadcast (one to many) and telephony (one to one) the technical management of CTS took a little time to wake up to the new patterns and problems created by group to group multipoint conferences with asymmetrical links. It is urgent to build into such networks the sort of audio teleconferencing technology that makes the Wisconsin ETN a technical success. Time and again echos and garbled sound made it necessary to repeat or relay messages between sites. Although the video component, which was usually of excellent quality, helped to overcome the disturbing effects of bad sound by reassuring people, there seems no good reason why the audio problems should not yield to a concerted technical ouslaught. In the organization of such multipoint conferences we share the University of Quebec view that formal presentations must be kept to a minimum during the conference and spontaneous interaction encouraged.

5. CONCLUSION

Two years ago the keynote address to the first of these Communications Conferences in Madison was given by Prof. Charles Wedemeyer who took as his title, "Satellite and Cable - - No Highway in the Sky for Conventional Teaching and Learning" (3). He observed that "communications technology in the U.S. has served its owners and controllers well -

the communications/entertainment industries - but has not yet served either schooling or education very well" and suggested that satellites provided a new chance to correct this situation. For Prof. Wedemeyer it was in the area of non-conventional adult education that satellites could most usefully be employed.

Although the Canadian CTS experiments in education do not follow Wedemeyer's suggestions to the letter there are encouraging signs. The University of Quebec experiment in particular has helped to establish that satellites in education need not simply mean telelectures and even within formal courses the pedagogical format seems to be becoming more participative with each project.

One potential danger concerns access to satellites. Clearly the institutions which have taken part in the CTS programme will be in a strong position to bid for time in other pre-operational and operational satellite projects. This natural tendency must not be allowed to squeeze out newcomers.

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EDUCATIONAL TELEVISION IN NEWFOUNDLAND

FROM STUDIO TO SATELLITE

10 Years Towards Interaction

W. Craig McNamara
Assistant Director
Educational Television Centre
Memorial University of Newfoundland

Memorial University of Newfoundland has now joined the exclusive group of Universities that may boast of interactive distant learning systems.

Borrowing a great deal on the experience and technology of the University of Wisconsin, plus our own considerable experience with passive distant learning systems, we established a pilot project based on teleconferencing. Admidst a great deal of self-congratulation and smugness, we initated the system and sat back to await the interaction. We're still waiting.

I am making an overstatement here to highlight what seems to me to be a common problem or mistake that most educational technologists make. The hardware design and implementation of a system, passive or active, does not guarantee successful usage of the system. It is the design and implementation of software or course content, specific to the configuration of a particular system, that facilitates successful usage. In actuality, we have a fair degree of interaction on our system; however, our most successful academic course seems to be the one designed specifically for the new system.

Before I discuss the special problems we encountered with the interactive system, I would like to trace our development leading to the project.

Educational Communications

In Newfoundland

Ten years ago the Educational Television Centre (ETV) was formed. Our original purpose was to provide broadcast - quality educational programming for release by Newfoundland's two commercial outlets, as well as to provide traditional university closed-circuit services. After the first few years, our direction changed. It soon became apparent that some system was needed to provide the teachers of Newfoundland with upgrading courses throughout the school year. Our response to the problem was the development of the off-campus credit course program through the establishment of a series of video-tape centres for the offering of university level courses throughout the Island and Labrador.

The off-campus credit course program continues to be our largest project, however, in recent years the Educational Television Centre has branched out into research and development projects such as (1) the Communications Technology Satellite program (CTS) "Telemedicine Experiments" and (2) the pilot project involving teleconferencing. It should be noted that the Educational Television Centre has not developed these various projects on its own; rather, we cooperate with many faculties and departments in the development of programs. Our usual role is that of softwear and technical development, working with content experts and experiment leaders.

The Road to Interaction

When an instructor is recorded on video tape and the tapes are played for students who may be up to 800 air-miles away, say the distance from Madison, Wisconsin to Pittsburg, Pennsylvania, problems develop concerning feedback or interaction. Memorial implemented several systems to attempt to overcome the barriers to interaction.

Telephone Conference Calls

During the pilot project for the off-campus credit course program, the developers turned to the telephone conference call as a method of interaction. In Newfoundland in 1969, traditional telephone conferencing was not 100 percent reliable. Although the instructor could hear the students and the students could hear the instructor, the students in some centres could not hear each other. Telephone conferencing was dropped after the inital year of the project.

It was apparent from the pilot project, however, that some student-instructor contact or interactive mechanism was desirable. The instructor responsible for the course had no contact with the students other than the assignments and exams that were graded at the University. With 400 to 600 students registered in a television course in as many as thirty different locations, it was difficult to achieve any meaningful communication without some form or method of interaction.

Audio Cassette Recorders

Audio cassette recorders were introduced to the off-campus program as a means to facilitate communication. The concept was that the students would view the video tapes, hold discussions in their respective centres, and record their comments and questions on audio tape. These tapes would then be mailed to the instructor who would listen to them and reply by return audio cassette. This approach was not successful for two basic reasons. First, and perhaps the major cause of failure, was the time delay or turnaround. It is difficult to carry our functional communication when you must wait two weeks for the reply to a question. The second reason for failure was that, again, it was assumed that interaction would follow automatically upon implementation of the system. Some attempts were made to guide interaction by offering topical questions, but in the majority of cases the feedback system was simply put into the classroom. Perhaps a concentrated program where the audio cassette was developed as an integral part of the course would have led to a more successful utilization of this method.

Human Interaction

Whether or not it was a step backwards in terms of technology, the officials of the off-campus program decided to return to a more 'human' form of interaction. The new method, which is still being used, was to hire a course 'tutor' for each centre where a television course was being offered. The tutor would be a member of the local community who had completed his degree and courses in the academic area of the off-campus course being taught by television.

It was hoped that the tutor would be able to guide the discussions after the video tapes and answer most of the questions raised. For those questions he could not answer, he would contact the University instructor by telephone the next day and feed the information back to the students, thus eliminating much of the time delay.

Generally speaking, we feel the tutor system has been successful. The actual role of the tutor depends to a great extent on the type of course being taught. Some courses require a great deal from the tutor while others demand very little.

While the tutor system seems to be satisfactory, it is not without its problems. It is often difficult, particularly in the more remote centres, to find individuals with the academic qualifications to tutor a course. It is also difficult to find individuals with the experience and maturity to direct group discussions among their peers. As with all systems dependent upon human resources, some tutors were excellent while others were marginal. The tutors were also placed at a certain disadvantage right from the beginning. Because of distances and the number of tutors involved, close to 100 per year, it was impossible to bring the tutors and the instructors together at one place. Thus, orientation of the tutors to the courses was minimal, as was close supervision during the courses.

Psychological/Sociological Factors

Before discussing our experimental work regarding interaction, a few remarks are in order concerning psychological and sociological aspects of distant teaching in Newfoundland.

The clientele for the off-campus credit course program consists primarily of teachers. Recent studies have shown that approximately 85 percent of the off-campus television students list their occupation as teaching. The majority of these teachers are working full-time and attending the courses at night. Judging from the comments received during field trips and evaluations, the prospect of attending a three-hour class after completing a full day's work is not always appealing and has a significant effect upon the desire to interact. The motivation for teachers to enroll for off-campus courses seems to be primarily financial. Newfoundland teachers must complete a certain number of university courses to qualify for advancement on the teacher salary scale. Our evaluations have indicated that this financial inducement is the strongest motivation for enrollment and that a certain degree of resentment in being 'forced' to take the courses in order to upgrade exists. If indeed this resentment is universal, it is bound to have some effect on the desire to interact. Finally, the interactive model is not the traditional model in Newfoundland education. The model is more along the lines of being 'lectured to' rather than 'discussed with'. These psychological/sociological factors must be considered when evaluating the effectiveness of interactive systems in education.

Because of the communication problems involved in distant teaching, a value judgment was made that discussion and peer contact was a vital element of an off-campus television course. This was one of the reasons we gathered the students together in common centres (the other being that broadcast was impractical due to geographic reasons). Until very recently, all television courses have been designed with time periods allotted for discussion or interaction. Recently, however, some instructors have questioned the value of attempting meaningful discussion or interaction utilizing the present system. The questioning of the value of discussion and the interactive process seems to be a result of field trips by various instructors. If questions were raised at all by students during these visits, they tended to deal with "what's on the final exam?" The whole issue of interaction in distance teaching warrants further study and research in terms of its actual impact on learning and retention by the off-campus student.

Interactive Experiments

Telesystems Education

The one-way communications flow of instructional television has been of continual concern to the producers at the Educational Television Centre. In 1974 the Centre received a two-year research contract from the Educational Technology Branch of Communications Canada for an experiment to modify a video tape recorder to accept a simple branching programmed learning package and to develop and evaluate a suitable software program.

During the first year of the experiment the technical staff developed a control system and interface that permitted interaction through programmed learning. The student sat at a control panel which contained four pushbuttons labeled A,B,C and D. The video tape recorder would present an increment of the lesson on which the student would then be tested. If he selected the button corresponding to the correct answer, the video tape recorder would fast-forward to the next increment. If the wrong response was given, the video tape recorder would enter the play mode and present a review lesson. Other controls on the panel included a "correct/incorrect" indicator, a stand-by light utilized when the machine was searching for the next lesson and a light that indicated termination of the program after three consecutive errors.

Software development was completed during the second year. A team of five instructors and producers was formed to develop both interactive and passive software packages. Evaluation procedures were also developed.

The actual experiment was carried out in two St. John's High Schools with 157 students participating. The experimental hypothesis was that students receiving instruction from an active television system would perform better on the final test than those receiving their instruction from a passive instructional television system. Three randomly selected groups of students were involved, a control group, a group receiving the instruction in the traditional passive form and the experimental group.

The results of the immediate posttest tended to support the experimental hypothesis. The experimental group receiving the programmed instruction on the active system scored significantly higher than did either the passive group or the control group. Further, a retention test issued 10 weeks after the experiment showed similar results.

Based on the experiment, it was concluded that the experimental method had a positive influence on the amount learned and the amount retained by the students involved. Unfortunately, the experiment did not show what component was responsible for these favorable results. They could have been caused by the immediate feedback as to right or wrong response, the remedial sessions for incorrect responses, the inclusion of additional material in the active system or perhaps the slower instructional pace of the experimental method.

Unfortunately, we were unable to continue our work with the system as funding was discontinued and the equipment was recalled for other purposes.

Meded or Telcom

During the 1976 convention of the Association for Media and Technology in Education in Canada (AMTEC), Dr. Lorne Parker, Director of Instructional Communications Systems at the University of Wisconsin, presented a paper on their use of the telephone in Education. The technology illustrated was of immediate interest to the staff of ETV and also to Dr. A.M. House, Assistant Dean for Continuing Medical Education at Memorial University.

During the conference, plans were discussed by ETV for a pilot project utilizing a system similar to that in Wisconsin. A trip was arranged to visit Wisconsin for a demonstration of their system.

Following the Wisconsin visit, both the staff of ETV and Dr. House were convinced of the potential for such a system in Newfoundland. The major problem facing such a project was the cost of telephone lines. We had decided that the dedicated four-wire system was the most desirable, however, we were shocked at the difference between line costs in Newfoundland and Wisconsin. Because of the high line costs in Newfoundland, it was felt that any viable system would have to be developed on a consortium basis with several users sharing costs. The consortium concept would entail its own problems such as proportioning costs and time allocations, however, it seemed the only possible solution in our particular situation. As ETV was already cooperating with the Extension Service on the off-campus program and with Dr. House and the Medical Faculty on the Communication Technology Satellite experiment, it was felt we already had the basis of a consortium for a pilot project using teleconferencing. We decided to go ahead and selected the town of Carbonear, about 60 miles away.

Carbonear was chosen for several reasons. First, the line costs of approximately $220 per month were within our budget. Secondly, a new regional hospital had just been completed in Carbonear and Dr. House felt our system would be of benefit to them and that they would be willing to cooperate with us. Finally, Carbonear was one of the locations for the existing off-campus program.

The trial consortium was formed with ETV responsible for the hardware and system development, the line costs being shared equally between the Extension Service and the Faculty of Medicine. The Extension Service would make use of the system during the evenings for the offering of two courses and the Medical Faculty would utilize the system during the day.

Actually, there was a fourth member of the consortium, the Carbonear Hospital itself. Pilot projects depend heavily on cooperation; the administration and staff of the Carbonear Hospital has done everything possible to ensure the success of the project. Two locations were wired in the hospital and equipped with Darome units. The off-campus students attended classes in the hospital auditorium and the medical staff utilized a smaller conference room. The rooms were wired in parallel and then to St. John's. In St. John's, The Carbonear link was connected to the system being developed for the satellite experiment, allowing interaction to originate from ETV, the Health Sciences Complex and the General Hospital. The project was initiated on January 11, 1977 and is still continuing.

The Education Courses Two courses are being offered during the project. One course, Education 3250, 'AdolescentPsychology', was designed specifically for this project. The second course, Sociology/Anthropology 2210, 'Communication and Culture', was a regular off-campus television course and for this project the discussion periods would be directed from St. John's. As both courses are still underway and formal evaluations have not yet been carried out, only general comments can be made concerning the effectiveness of the system for off-campus education.

At this point, the Educational Psychology course, designed specifically for the system, is more cussessful in terms of interaction. Because of the nature of the course design, the students are required to interact. The content for the S/A Communications course is delivered by video tape, and interaction occurs only if the students feel a need for clarification. Again, the psychological/sociological factors mentioned earlier must be considered as an explanation for this difference.

Several points have been noted concerning the actual use of the telephone system. First, the students were apprehensive about using the hardware. It is suggested that two factors cause such apprehension. This is the first time that most of the students have used a microphone-based system and some nervousness is to be expected. Secondly, the students are being asked to interact with the instructor and there is a degree of evaluation implied based on the quality of their responses. It is suggested that the nervousness concerning usage will disappear with time, however, the reluctance to participate in public will be much more difficult to overcome. We have also found that there is a need for some kind of a group leader in each class, both in terms of interaction and administration. For the television course we retained the course Tutor as back-up against a telephone system failure. We found, however, that the Tutor was still useful even though the discussion was being directed from St. John's. Because of the reluctance of students to initiate interaction and the fact that the instructor cannot see what is happening, someone is required to start things off and inform the instructor of what is happening at the other end, if only to inform him that the signal is being received and that there are no questions. There are, of course, administrative duties which must be completed such as the passing out and gathering of assignments. Similar difficulties existed with the Educational Psychology course, so a Teaching Assistant was appointed.

The general reaction to the use of the telephone system in off-campus instruction is favorable. The most important consideration is that the students have the opportunity for immediate interaction with the instructor if they so desire it. It is felt that the combination of television and the interactive audio system could be used to great advantage. New course design, however, would be necessary to take full advantage of the system potential. The simple transfer of courses designed for video tape distribution does not allow the instructor to take full advantage of either system. The two systems have the potential to compliment each other and effective course design should benefit off-campus instruction.

The Medical Projects The medical use of the system has been under the direction of Dr. A.M. House and Mrs. E. Canning, a half-time Research Assistant appointed by the Faculty of Medicine.

A wide range of activities has been initiated since the system became available, with many more planned. For example, the Newfoundland Pharmaceutical Association and the College of Trades and Technology are interested in exploring the system to provide continuing educational training and as a means for providing rotational students with tutorials and supervision. The staff and administration of the Carbonear Hospital have begun to request the facilities themselves. Recently a seminar was sponsored in St. John's by the Newfoundland Hospital Association, and several Carbonear members participated through the telephone system. Plans have also been made to have the St. John's members of the Carbonear Hospital Board of Directors participate in a board meeting via the system rather than by traveling to Carbonear. The Nurses of the Carbonear Hospital have requested the Memorial University School of Nursing to offer a series of weekly seminars over the system, the first of which was held during the week of February 7th, 1977. Other medical uses of the system have included patient presentations and general liason discussions between the Faculty of Medicine and the Carbonear Hospital, which is one of the affiliated teaching institutions.

Interestingly enough, the system has been used fairly extensively as a vehicle for planning future programs which would be carried on the teleconferencing system. Thus the system itself is being used to help plan its future usage.

As the medical development of the system has little direct involvement with the Educational Television Centre, more accurate information of present and planned usage might be best obtained from Dr. A.M. House, Assistant Dean, Continuing Medical Education, Memorial University of Newfoundland, St. John's, Newfoundland, Canada.

The interaction during medical usage of the system differs considerably from that during the education courses. There seems to be little reluctance on behalf of the medical staff to interact freely with their peers. It is suggested that this is a reflection of their confidence in the subject matter and is contrasted to the student/instructor relationship. Again, the psychological/sociological factors that influence teacher upgrading are not present in the medical situation.

The medical use of the system, however, has raised another technical consideration, that of confidentiality. The present configuration of the 4-wire system is that of a party-line and confidentality cannot be guaranteed. This is a valid point of concern for medical usage in both patient/physican consultation and medical teleconferencing. It is perhaps not so important in continuing medical education if confidential patient information is not involved. The confidentiality problem presents some difficulties in planning an expanded system, however, the ETV Technical staff feels this can be overcome through scramblers or special switching equipment. This will involve extensive technical planning and additional expense.

The Communications Technology Satellite Experiment 'Telemedicine Experiments'

The Telemedicine Experiments project on CTS is scheduled to begin officially on April 1st, 1977. It is impossible to discuss the interactive aspects at this time since the initiation of the project is still eight weeks away. It is possible, however, to look at the system configuration and the anticipated outcomes.

Throughout the experiment, a video and audio signal will be transmitted from St. John's to four locations throughout the Province. Hospitals in Stephenville, St. Anthony, Goose Bay and Labrador City will receive these signals and will be able to interact with St. John's through a return audio signal. There are three origination points in St. John's tied together by microwave and cable. Studio B in the Educational Television Centre will act as the main origination point and switching control center with programs also originating at the General Hospital and the Medical Audio Visual Services in the Health Sciences Complex (MAVS). All sites will be able to interact freely through the Darome audio equipment.

Although the satellite broadcasts do not commence until April 1, we have been carrying out simulations or pilot broadcasts for the past few weeks. ETV is interconnected with the General Hospital by a full duplex video/audio microwave link and to MAVS by midchannel cable. Both the hospital and MAVS are capable of originating television programming. These simulations have been valuable training for the experiment participants as they provide the opportunity for practice in the interactive mode. Needless to say, we have also identified and solved a multitude of production and technical problems through the simulations.

We expect the interaction in the CTS experiment to be very similar to that experienced in the medical usage of the teleconferencing system to Carbonear. The programs are basically continuing education and the participants will be interacting with peers or professionally related individuals. There will be little of the student/instructor relationship.

The Telemedicine Experiments project is a large undertaking, much too complex to discuss in depth here. Basically, it is an experimental undertaking shared by the Faculty of Medicine and the Educational Television Centre and funded by Communications Canada to explore the potential of satellite communications regarding medical education and health care delivery in rural Newfoundland. Because we are externally funded for this project, we will be able to evaluate our findings in greater depth. A separate contract has been let by Communications Canada to Mr. Alan Pomfret, Director of the Program Evaluation Unit, Institute for Research in Human Abilities, Memorial University. Mr. Pomfret, working in cooperation with several groups, will evaluate the entire project. This evaluation will give us the opportunity to study the results of the interactive process over a wide range of applications.

SUMMARY

Distant teaching systems usually involve either itinerant instructors or some form of the correspondence model. The itinerant instructor model ideally brings all the benefits of traditional education to distant teaching. Unfortunately, it is not effective in terms of cost or the realities of instructor time. The correspondence model is potentially cost-effective because of its ability to reach many students in different locations, however it is usually a passive system involving one-way communication.

The question facing educational administrators considering implementation of distant learning systems is one of cost-effectiveness versus instructional-effectiveness. Interactive systems draw on the strengths of both the itinerant and correspondence models and can achieve most of the advantages of traditional classroom education while still reaching large, physically separated groups of students.

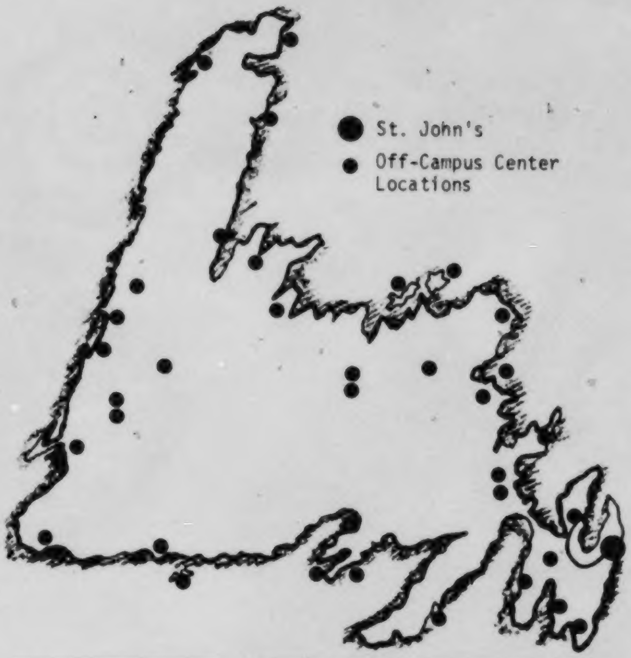
The implications of "mass" education might still cause some consternation, conjuring up images of thousands of students with telephones stuck in ears and eyes red from television. As stated earlier in this paper, however, effective software development can eliminate most but not all of the detrimental aspects of mass instruction.

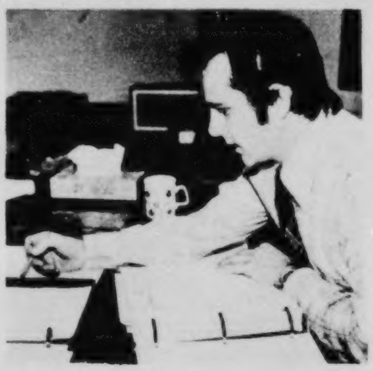
Interaction that adds up to effective instruction will not happen by itself. It will not develop simply through hardware implementation, nor will it develop through the simple substitution of programs that might have been effective on some other system. Interaction must be carefully planned with educational objectives and system configuration in mind, as well as with a knowledge of the educational traditions of the receiving students. In other words, don't expect interaction without work and without giving the students time to become adjusted to the new educational format.

Finally, it is important that we develop some meaningful guidelines for the implementation and effectiveness of interaction across a wide range of applications. To do this we must evaluate our programs and report the results. Unless interaction adds another dimension to the instruction and has a measurable educational benefit, we are just playing with technology for technology's sake.

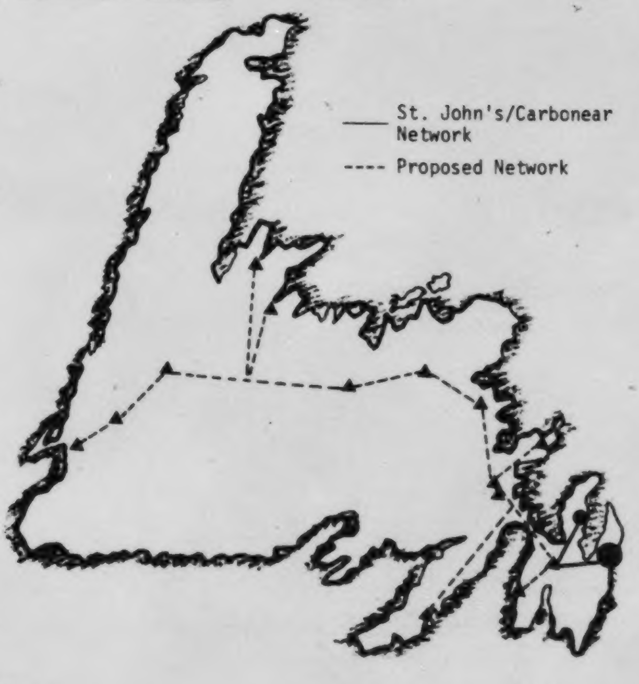
For more information on Distant Learning Systems at Memorial University see:

MacKenzie, Norman; Postgate, Richmond; Scupham, John. Open Learning: Systems and Problems in Post-Secondary Education. Paris, France, Unesco, 1975





Dr. Bryan Hartmann interacting with the Carbonear students



TELETEACHING: JUST WHAT THE DOCTOR ORDERED

Bettye Hill Braucher
Instructor
Teleteaching
Tucson Public Schools
Tucson, Arizona

Why should a child be punished for being ill or injured? No one would consciously do such a thing. Yet every year thousands of schoolage children are penalized for being absent from their classes because of lengthy illnesses or because a congenital defect calls for extensive surgery or because of serious injuries suffered in a wide variety of accidents. They can't go to school, so they are retained-failed -falling behind their classmates through no fault of their own.

Few school districts can afford to provide tutoring for a student confined to the hospital or his home. Perhaps the student's regular teacher will offer to assign homework and then check and grade his papers which are carried to and from school by his parents. Unless the teacher also arranges to visit the student, instruction becomes the responsibility of the parents. Better than nothing, this is far from a satisfactory way of solving the problem of continuing a student's schooling. Furthermore, it adds to the pressures on an already overworked teacher and parents, and does nothing to alleviate the student's isolation and accompanying boredom.

In other communities, home tutoring has been the solution, with teachers hired specifically to teach homebound students at home or in the hospital. In Tucson's District One schools, this service has been available for nearly thirty years. Each student was visited one or more times weekly for a period of one to four hours, during which his teacher worked with him in math, grammar, reading, science, social studies, and so on, checking previously assigned work, making new assignments, and then driving on to the home of the next student on the day's schedule.

A better way, certainly, than the other, but it also failed to penetrate the isolation of homebound students. And in a sprawling city such as Tucson--encompassing 250 square miles--the reimbursment of homebound teachers for hundreds of on-the-job miles became increasingly expensive, long before the Arab Oil Problem manifested itself, as the city grew rapidly in all directions and fuel costs rose relentlessly.

In search of a less expensive means of providing instruction for homebound students, the School Board approved a study of Teleteaching as a possible acceptable alternative. Then in 1972, after more than a year of preparation, Tucson's first classes by telephone began, largely patterned after a program in Los Angeles County schools now for more than 15 years.

Beginning with one Western Electric Telex console and many misgivings, the home bound teachers started off, not knowing quite what to expect, and prepared for a totally unfamiliar teaching procedure with only their years of experience as former classroom teachers and tutors. Now, four years later, Teleteaching continues to grow, finding capabilities never dreamed of and serving increasing numbers of students.

Tucson's Teleteaching program operates out of cramped temporary quarters in the Morrow Education Center, administrative hub of the district's nine high schools, 18 junior highs, and 65 elementary schools. Homebound elementary students continue to receive home tutoring, but all junior high and high school students are taught by telephone.

Because students transfer in from any of the district's schools, the first major decision was to establish a curriculum, including all courses required for graduation and a large number of electives. Teachers also selected textbooks, planned study units, and chose material and equipment that would be loaned to teleteaching students during their enrollment in Teleteaching classes. Most incoming students would have already purchased books and equipment required by their home schools; to have to buy additional

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books seemed unreasonable, since most would return to their schools when they recovered, anyway.

Every effort possible was made to ease the transition into Teleteaching, to minimize the anxiety most such students already had concerning their health, the interruption of normal activity, and a change in schools with all the attendant worries. Working with the respective high school or junior high counselors, Teleteaching arranges a schedule which provides for a maximum degree of continuity, reflects the interests of the students, and assures credits transferrable to their home schools when they are able to return to regular classes. In some cases, when a student has enrolled after the quarter is well underway, a matching course is not available. Then the student's regular teacher is asked to supervise a program of home study that will permit him to complete the course work and receive credit. Such cooperation between the homebound program and the students' home schools has not always existed.

An enrolling student must have an affidavit signed by his doctor, identifying his illness or disability, and confirming his need for confinement at home for a minimum of approximately 45 school days, the equivalent of a school quarter. However, students who recover more rapidly than anticipated are in no way penalized, nor are they required to remain on the program for a full 45 days. School counselors and Teleteaching recommend that students complete the quarter with Teleteaching to avoid further interruption of studies and to assure their earning full credit despite earlier absences.

Early in 1976 a second teleclass unit was installed, doubling the number of classes that could be scheduled. Both consoles are in nearly constant use, with 40-minute periods scheduled throughout the day, beginning at 8:00 A.M.

At present the teaching staff is comprised of six fulltime teachers and three part-time, the latter also teaching homebound elementary students and students in the TeenAge Parent program for pregnant girls. Two or more of the fulltime teleteachers also instruct TeenAge Parent classes in their building, and TeenAge Parent students are among those taught by phone, utilizing the teleclassroom also at their building.

Flexibility and adaptability are prominent characteristics of both Teleteaching and TeenAge Parent program. Enrollment on both programs changes constantly and fluctuates unpredictably, not only during the year, but also from year to year. Basically, both programs must be attuned to the needs of a succession of individual students.

The 40-minute period was established as a more reasonable length for classes than the customary 50- or 55-minute periods.

Since intensive auditory concentration would be fatiguing for most normal students, a shorter class period seemed advisable for students whose disabilities and strength varied from minimal to extreme, sometimes from day to day for students undergoing treatment such as chemotherapy. Furthermore, since most students must use handsets, the potential for fatigue is increased. Including a ten-minute break between classes also is considered necessary, especially for students with classes in succession.

Classes meet two, three or five times a week, much as they do in regular schools. In Teleteaching, a State Board requirement makes mandatory one hour per week of face-to-face instruction for each student. Math and science courses in particular benefit from working directly with the student. Thus math and science teleclasses meet two or three times a week, with each student receiving an additional hour of instruction during his weekly home visit.

Since enrollment in the homebound program typically begins with a very few students at the beginning of each quarter and steadily increases, grouping students in 7th-8th, 9th-10th and 11th-12th grade groups is a convenience, especially for high enrollment classes such as English and physical science. (Abilities are not closely identified with age levels, but maturity is a significant factor, indicating that a broader grade-level range should be avoided if possible.)

Enrollment in classes ranges from two to a maximum of 19 students, the latter determined by the Telex which can accommodate 19 separate connections, with an incoming line reserved for calls of students inadvertently disconnected.

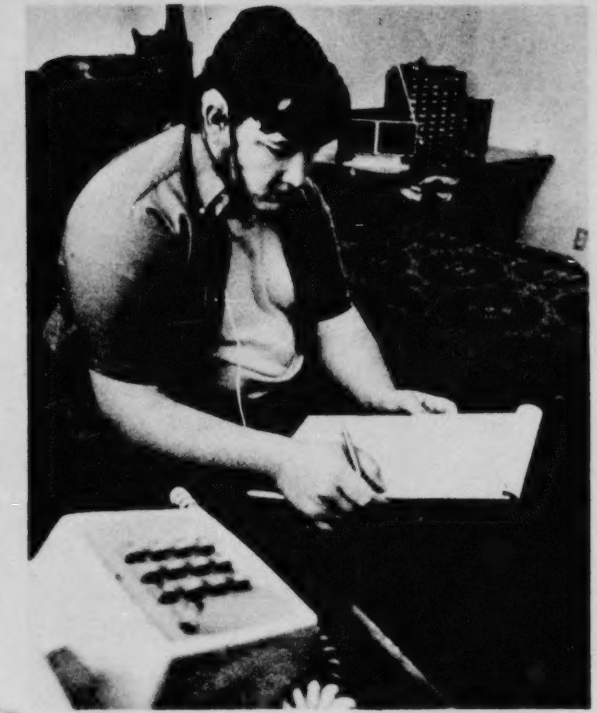
Assembling a class of 15 to 19 students takes approximately seven minutes, facilitated by the automatic dialer and dialing cards, each punched with the phone number of the student. Momentary malfunction on the switchboard or on a student's line may require re-dialing, increasing the time used for calling the class together and lost from actual class time. To minimize the time wasted in assembling a large class, a teacher will ask the first student to greet the rest as they come on the line, adding instructions for certain materials to be used in class that day. This not only frees the teacher to feed cards into the automatic dialer, but it also provides the students with a voice to answer their "hellos" instead of a deep silence. Students who have become better acquainted often chat during this interval, establishing a comfortable, friendly atmosphere for the entire class.

When all dialing is completed, the teacher takes attendance. As each student replies, a light flashes beside the slot holding the student's dialing card. The voice identification light is a boon to teachers of the larger classes, but students quickly learn to recognize each other's voices without the convenience of the voice lights on the console.

The Telex unit offers several useful features which help to approximate typical classroom activities. A grouping key allows the teacher to divide the class into as many as four separately operating groups, ideal for practicing spelling, doing foreign language drills, working as committees on projects, and so on. Students within a group can work together without disturbing others or being disturbed. Or a student who may have missed a class can be helped by a fellow student, while the rest of the class works with the teacher on something else.

The capability of singling out a student apart from the class makes it possible for the teacher to check answers on an oral test. It also makes it convenient for a private conversation with a student, without causing embarrassment to anyone, whether its purpose is to seek help from the teacher on a very personal problem or to administer a tongue-lashing to the student.

A very real advantage teleteachers have over the classroom teachers is the ability to deal with a disruptive student firmly and conclusively: push a button, and the troublemaker vanishes from class.



Telestudents are expected to participate actively in their classes, that is, to answer when they are called on or, better yet, to volunteer answers. For most students whose former classes have averaged between 30 to 40 students, this is always an adjustment. They are used to classes in which they are rarely called upon, if at all. When asked to respond, typically they remained silent, and--typically--the teacher would go on to someone else.

Since Teleteaching is totally auditory, students must speak. Teachers are patient and friendly, giving them plenty of time to marshall their courage, encouraging the faltering starts into full-blown replies. Teachers disregard most of the "I-don't-knows", recognizing them as the automatic response of the new student, of the student whose selfconfidence has not fully developed.

Teachers encourage participation in other ways, too--by having students read directions for an exercise, questions under discussion, and content paragraphs. Classes undertake reading plays or tackle poems for choral reading--and because all classes are small, everyone has to accept a part. The anonymity of the phone seems to help students overcome their usual reluctance or outright refusal to perform in class; with the encouragement of class "hams", the shyer students learn to relax and lose themselves in their assigned roles. Whatever a student can do to genuinely help, he is asked to do, on the premise that involvement in worthwhile activities is an effective way to learn.

Students also are encouraged to request help and to ask questions whenever they don't fully understand. They are assured that there will be no penalty or ridicule, that the teachers are there to help everyone.

Teachers learn to give directions and to explain things as simply and clearly as possible, using few words, pausing to give students time to write things down, and patiently repeating necessary.

When a student seems unable to find the right material or the right page, a teacher learns to ask him to read from whatever he is looking at at that moment. Then the teacher guides him forwards or backwards, up a few lines or down a few, to the right, or to the left, until the student has located what he needs. Sometimes students don't associate what has been described with the material in front of them. By reading a line or two, or by describing the material himself, the student helps the teacher become oriented so that he can lead the student in the necessary direction.

Students seem to benefit from this dependence on auditory instruction. Close attention is mandatory, they soon discover, and many return to their home schools as better listeners, better followers of directions.

Homework and written assignments are just as much a part of Teleteaching as any other school. However, handing in assignments at the beginning or end of a class is obviously out of the question. Instead, the written work is placed in an inter-school envelope stamped with TELETEACHING and is taken to the student's contact school by his designated carrier--a brother, sister, parent, friend, or neighbor. There it is placed in the school's mailbag which is picked up daily and taken to the Education Center where Teleteaching offices are located. When the envelope reaches the office, its contents are distributed to the appropriate teachers who check and grade the homework, and then start it on its return trip to the students. What is a rediculously simple procedure in a classroom becomes a laborious, time-consuming one for Teleteaching teachers and students.

Because shared visual experiences are very limited for teleclasses, students are assigned television viewing whenever possible. Sometimes the assignment is a classic dramatic performance. Documentary specials are other popular assignments. Keeping a record of news stories carried by local stations for comparison with the networks' programs helps students become aware of current events as well as the relative merits of local and national news coverage.

The specific needs of a course

will determine the purpose of the televiewing assignment, of course, and guide the teacher's pre-viewing preparations for the class. With the stage set, students then are expected to watch the program, gaining the insight anticipated by the teacher. Then, in culmination, there may be a quiz, a report, or a class discussion on the effectiveness of the presentations.

The cooperation of the student's family is basic to the success of assignments such as this. All too often the TV assignment is a disappointment because too many families--and students--were unwilling to alter their viewing schedules in homes having only one television set. Families of long-term students are usually more cooperative, more understanding of the importance of adding this visual dimension to their students' education by telephone.

Teachers also use cassette and reel-to-reel tapes in their classes, utilizing the capability of plugging a tape player directly into the console for direct transmission, or by playing the tape into the studio speaker. Providing each student with a copy of the script or with a set of script notes serves as a point of reference for each, as well as being visual reinforcement.

Guest speakers are also a means of adding vitality to a daily telephone class. A guest may come to the office and attend class in the studio with the teacher, where the voice activated lights on the console allow him to "see" the students as they speak. Or, for the very busy businessman, a teacher can arrange a hook-up for the speaker who may remain at his own desk and talk with the class.

During the past year, guest speakers have included a School Resource Officer from the Tucson Police Department, speaking on legal rights of juveniles; the student council presidents of several area highschools evaluated their respective student governments, and discussed the merits of a prospective students rights bill; an insurance agent explained coverage of auto insurance policies to members of the driver education class; a former student read Spanish poetry and discussed it with a group of students in the advanced Spanish class; the public relations editor of a local newspaper discussed responsibility in news reporting; and the Mayor of the City of Tucson defended his stands on current campaign issues such as annexation, mass transportation, and so on.

Members of the Teleteaching staff also sometimes serve as specialists for one another. Recent visits to China, Greece, Pakistan and India have given two staff members special insight into the culture and social issues of those countries, adding a new dimension to the students' understanding. Another staff member is a frequent winner of local and regional bowling tournaments. Still another is a backpacking enthusiast, hiking extensively throughout the West, while another is a published, free lance writer. So, in addition to a city full of famous and not so famous people with expertise ranging from Astronomy to Zoology, the Teleteaching office itself is a source of guest speakers who help a teacher make lessons by phone more lively.

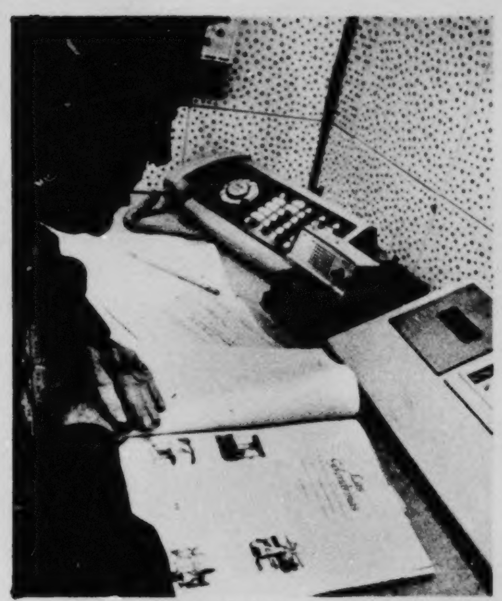
Regular staff meetings are held to compare notes on students, primarily for recognizing incipient attendance problems or non-production where assignments are concerned. Exchanging information that collectively indicates a need for a visit from our psychiatric social worker/teacher or a warning note from the office sometimes helps students while there is still time to do so. The team approach to working with students is not only possible in Teleteaching, it is necessary.

A pilot program begun this year may become a means of extending Teleteaching to those who are not hospitalized, contagious, invalided, or emotionally handicapped. Students suspended by their schools may now with the approval of the appropriate administrator continue their education via phone until the terms of their suspension are completed. Thus, healthy, whole students have been added to class rolls, with the result an instilling of somewhat higher academic expectations on the one hand, and the learning of patience and tolerance for fellow students who are permanently or temporarily disabled, on the other.

Such total dependence on auditory interaction makes it imperative that students and teacher have exactly the same books and study materials in front of them during class. This visual point of reference may be the only one that they share.

Still in the developmental stage, Teleteaching in Tucson is adding continually to its supplies of textbooks, reference materials, loan equipment and so on, so that each student enrolling in teleclasses will have exactly what he needs. New units of study, especially designed for presentation during the nine weeks of a quarter and complete within themselves, are being developed. Means of teaching lab courses are being explored so that someday a telestudent can continue with his chemistry and physics classes, as well as the conventional classroom courses.

Unit kits for some classes are being planned. In the near future, a biology student may be supplied with a kit containing a microscope, several sets of slides, a workbook, a small viewer and film strips, and any other materials he may need during the quarter.



Wherever possible, we feel we must supply visual stimulation to augment and reinforce the auditory, a tedious developmental process, and an expensive one. Among useful devices on the market, one of the most promising is TeleNotes, a system of exchanging written information instantaneously between teacher and student, teacher and all students, or between students. Math and geometry especially could gain immeasureably from the use of such a device, but so also could spelling, art, foreign language study, English creative writing, journalism, sports and so on. Demonstrating skills in math or writing, revising or correcting homework on the spot, all have the important element sometimes sorely missed in Teleteaching--immediacy, correcting procedures before the wrong way becomes a habit.

TeleNotes, a product of Talos Systems, Inc., utilizes existing telephone lines and requires no special installation. Providing a sending-and-receiving unit to each student at the cost of $2000 per unit means an enormous outlay, well beyond the range of school districts already cutting corners and costs severely.

Telestudents must be on private lines, and most Tucson families are. Beyond that requirement, a student needs only his ordinary phone, unless he is unable to use both arms, has a head injury, or is immobilized in some way that makes the use of a handset difficult or impossible. In such cases, the family can arrange at its own expense for a speaker phone or a headset through Mountain States Bell Telephone Company.

Periodically a new student will attempt to use a commercially available phone amplifier. Results are almost always disappointing; although the student's reception seems satisfactory, his participation in class is nullified by gross distortion of his speech, to the extent that he is unintelligible to his classmates and teacher.

The phone company services the Telex consoles, checking them for weakening trunk lines, malfunctions in the automatic dialer, and so on. Sound fidelity is a continuing problem. Console equipment operates best on an extremely delicate balance which is lost frequently and re-

gained only with expert servicing.

Student lines also cause trouble, some erupting in static inexplicably, others so weak that students are always being asked to repeat. Home telephones may need servicing to improve voice transmission; at fault often are components which have deteriorated and need replacement. Carelessly plugged in jacks have been frequent offenders; students are always asked to check their connections to eliminate the easily remedied causes of poor transmission or reception. Finally, parents are asked to call the phone company for service when a student's phone is operating at less than maximum efficiency. For prompt service, the families are asked to emphasize that the phone is used by a student in Teleteaching.

The problem of isolation faced by a student too sick or injured to continue his regular schooling diminishes rapidly through Teleteaching, as students entering classes find out. Voices soon become familiar, shyness slowly gives way to easy give-and-take, and many become friends, calling each other between classes not only to work together on assignments, but simply to gab awhile.

An ongoing project that is designed not only to be a learning tool but another means of identifying with fellow students is TELENEWS, issued four or five times each school year. Students write articles, poetry, stories and editorials. They do the art work, devise puzzles, send in jokes and recipes. And they send along their snapshots to accompany their contributions to that issue of TELENEWS. Most important, one page of each issue is devoted to phone numbers of students currently enrolled.

Esprit d'corps is a good thing, Tucson's Teleteaching believes. So two parties are scheduled annually--one at Christmas and the other at the end of the school year. Contrary to popular belief, junior high and highschool students DO like school parties, especially when each person is expected to bring something.

"Come and meet your classmates in living color!" And they do, every student who can, on crutches, in wheelchairs, flat on their backs, as well as those whose recovery makes them appear normal and healthy!

TELELECTURE IN MINNESOTA

Wayne H. Hanson, Professor
Ag. Ext. Service - University of Minnesota
St. Paul, Minnesota

Minnesota has 92 county Extension offices in its 87 counties staffed with 240 county Extension staff members. These offices and personnel provide the framework through which telelecture programming has been built in Minnesota.

Each county Extension staff determines whether or not they want to have telelecture programs in their county. If they decide to use telelecture they request the programs that they want and the month or months when they want them. Telelecture equipment in each county is installed a few days before the first scheduled program and removed the day after the last scheduled program. Some installations may be in for only a month or two and others for six months or more.

State Extension specialists in Ag and Related Industries develop educational programs that they will be willing to present by telelecture. Descriptions of these offerings are printed in a loose leaf notebook and furnished to all Extension staff members in March each year. The telelecture offering description includes the purpose, subject matter and name(s) of the faculty.

For the program year 1977 there were 55 telelecture offerings by Ag and Related Industries Extension specialists.

Following are two typical telelecture offerings:

Dairy Breeding Seminar

Purpose To make breeders aware of modern genetic improvement principles and how they can be used for genetic improvement.

Content Illustrated presentation on sire selection choices, how to plan matings, herd turnover, cow culling and management factors affecting the results.

Faculty B. J. Conlin, C. W. Young and other staff members of the Department of Animal Science.

Landscaping for Minnesota Homes

Purpose To teach principles of home landscaping design and appropriate use of materials for developing functional and attractive home sites.

Content Illustrated lecture, 1½ hours in length showing successful home landscapes of several types. Space planning, circulation and landscape materials suitable to the state are included.

Faculty Jane McKinnon, Extension Specialist Horticulture

County Extension agents are provided with special forms on which they request telelecture programs. The requests for telelecture are due June 1 each year for the period October 1 through September 30. The request form lists the title of the program and the month or months the Extension agent wants the program.

The State Extension scheduling office sets up dates and groups the counties together that requested the same program. This proposed telelecture schedule is sent to the counties and Extension specialists involved for their changes or approval. The final corrected copy of all telelectures for the year October 1 through September 30 is sent to the counties and Specialists in August.

Additions, changes or deletions in the schedules can be made any time during the year. Each year there are one or more major additions to the telelecture schedule in the counties. A typical example occurred in February 1977 when a special telelecture was presented in 37 Minnesota counties in a three day period. These telelecture programs were presented because of a need expressed by county Extension agents and farm credit personnel for help in understanding the new Farm Security Act. The same procedure was used in 1975 to meet the need expressed by county Extension agents, beef producers and processors on the new regulation on D.E.S. for cattle and meat shipping to Canada.

The principle of having each county Extension staff determine and request the help they need by telelecture makes scheduling more difficult. The advantage is that the objective of providing specialist help where the interest and need has been determined in the program planning process in the counties involved is reached.

Summary

Listings of titles, purpose, subject matter content and faculty available for help in county Extension programs by telelecture are provided to county Extension agents each year.

County Extension agents request telelecture programs that they feel will supplement their educational programs.

Counties are grouped together and dates agreed upon for telelecture programs by the scheduling office in consultation with county Extension agents and specialists.

Although scheduling of telelecture programs is completed in August for the following year, major changes and additions are made during the year to meet special educational needs.

ADMINISTERING CONTINUING EDUCATION:
AT THE PILOT WHEEL IN EVER-SHIFTING SEAS

Dr. Phillip E. Frandson
Dean, University Extension
University of California
Los Angeles, California

Continuing education is the fastest growing segment of higher education today. There are currently more than 25,000,000 adults enrolled in part-time study offered by postsecondary institutions throughout the United States. Already these part-time adult students constitute the majority of all students enrolled in such institutions, and present trends indicate further expansion both in number of registrations and in depth and breadth of study.

The reasons underlying such anticipated continuing expansion are complex. Some of it can be traced to the increasing availability of part-time, or "extended" degree programs. However, while we can expect that a percentage of adult part-time study will always be degree-oriented, the increasing majority of adult students seek, rather, non-degree programs.

The single greatest factor in the expanding need for non-degree programs is *change* -- the accelerating rate of change as well as the extent of change -- change through advancement of knowledge, through increased specialization, through scientific explorations that impact national and international sociopolitical systems, through the upheaval of traditional values and standards in personal and social life. These kinds of change in turn have engendered other kinds of change: changing individual life styles; drastic change in moving through the developmental stages of adult life, with the changing personal needs that ensue; and recurrent change in the world of work, with minimally the necessity for constant "upgrading" in a given profession, and maximally the shift to "new careers," often as many as five or six times within the work life. Finally, these changes, especially in the advanced scientific and technological fields, have brought about a degree of interdependence among individuals, groups, institutions and organizations unprecedented in any country anywhere in history.

This is the societal picture to which continuing education must respond. And when we add to these changing patterns the changing demographics of our society -- particularly the declining birthrate and increasing proportion of older people -- it is hard to envision anything other than mushrooming expansion of adult education to keep pace with it all.

How shall we, the continuing educators, structure ourselves to respond? First, it is essential to define what continuing education *is*.

What is the Role, or the Mission of Continuing Education Today?

The mission of continuing education is to bring to the adult community beyond the college/university campus the opportunity to benefit from the talent, research and resources available to the graduate and undergraduate student in the campus milieu. Such a mission involves (1) assisting individuals through educational and related experiences to achieve personal and career fulfillment; (2) serving public and private organizations through educational programs designed to meet their specific needs; (3) serving the public at large through the application of community resources, as well as the resources of the institution of higher learning, to social issues and problems; and (4) improving educational processes, nontraditional as well as traditional, as they relate to continuing education. In short, its mission is to nurture and enhance the quality of human life through lifelong education and public service, for the adult community beyond the campus.

The courses and curricula designed to carry out such a mission are necessarily different than the standard postsecondary education curriculum. Close though the ties must be between the sources of graduate and undergraduate learning on the one hand, and on the other the sources of continuing education, the needs of their respective student bodies are in certain aspects quite dissimilar. The academic institution looks at academic issues primarily from an academic and disciplinary viewpoint. The rest of the adult world, the more we move toward non-degree study, sees many of the educational processes from a different view. Often the issues of the outside world are overlapping. They do not break down into academic disciplines. The trend in continuing education is necessarily to deal with the phenomena of the world, and the standard university academic model is not translatable into those terms. The planners, developers and implementers of continuing education must be thinkers who deal with the phenomenological view of the world rather than with the disciplinary.

Moreover, in the context of constant change, it is essential that both the administrators and the course and curriculum planners in continuing education be keenly aware and alert to the crucial trends and issues and pressures of the times. The word "innovative" has been done to death in recent years. Yet the concept is essential, in that the continuing education specialist must be not just an analyzer but beyond that a forecaster of audience needs -- both responding to such needs, and providing leadership, through education to help individuals and communities to cope with new issues and crises just surfacing on the horizon. Merely to look around for innovative programs produced by other extension divisions is not enough. Such programs, valuable indeed in the year they are presented, may be already dead by the following year. What must be cultivated, rather, is the innovative thinking process itself.

Of key importance, too, is the need to keep in mind that the adult non-degree-oriented learner is the controlling force in his/her learning process. Study is done at the adult learner's initiative, and he/she is in charge of its directions. The continuing education specialist's particular expertise must be based on new kinds of foundations:

1. The "relatedness" component -- that is, the concept that learning must relate to the

learner's identity, experience, and personal view of life's meaning.

2. The "action" component -- that is, the concept that learning must enhance the adult's ability to *act* with respect to his/her inner life, relationships with others, decision-making in the public sector, and professional or other career goals.

3. Summarizing (1) and (2), adults will not become deeply involved in, or deeply absorb, learning not directly part of their lives and their futures.

With these elements in mind, then, as the unique mission and role of continuing education,

What Organizational/Operational Structure Can Best Serve the Adult Part-Time Student Audience?

One of the hottest controversies current in the adult education field is that of centralization versus decentralization. Or in other words, where, within the institution of higher learning, shall lie the responsibility, the authority, the opportunity for educating the part-time student?

In the early days, "extension" was primarily a brokerage office for campus activities -- a second-class citizen with a second-class-student audience, and largely subservient to the programs and interests of the "main campus" faculty. Today, however, with the great expansion of part-time study, extension has become a center of influence, of power and of income. This has brought about a movement among faculty on many campuses to transfer this source of income and public influence from the extension hands that built it, and disseminate it among the individual colleges, schools, and departments of the main campus of the postsecondary institution. Such "decentralization" envisions that each department shall have its own private little extension world.

On the other side of the issue are the advocates of "centralization," which at the present time is defined over a broad scope of structures:

1. At one end of the centralized spectrum is the Extension Dean or Director who serves primarily a coordinating function, with much of program planning, budgeting, personnel hiring, and related areas of responsibility under the aegis of individual departments or schools on the main campus.

2. At the other end of the centralization range, the Extension Dean or Director has full responsibility for program initiation, planning, development and presentation, as well as employment of personnel, budgeting, promotional activities -- indeed for all continuing education functions with the exception of final academic approval of courses and instructors.

While I shall always hold that there is room for every pattern, and certainly a need for continuing experimentation in every aspect of learning, nevertheless to best serve the present needs of society it is my own view that maximum effectiveness can be achieved through the last of the three patterns mentioned -- that is, the strongly centralized continuing education or extension division. This is true, it seems to me from both the managerial perspective and the educational perspective.

The overall objective is clearly to generate the greatest benefit for society with a given amount of available funding. To this end a *good managerial perspective* is essential, and good management implies several specific elements. One is the matter of *overall organizational planning* regarding the number and nature of programs to be delivered to the community -- clearly best accomplished through a centralized management structure. Another is the *development of an effective support staff,* comprising the functions of registration, recording, program processing and implementation, information and advisory services, business and fiscal office, personnel office, public relations. Only a centralized structure can provide effective load-balancing of manpower and facilities in these areas -- load-balancing which often makes the difference between covering expenses and operating at a loss. Timing is often critical -- and the centralized operation can function with a minimum of down-time, without the necessity for routing via various sub-units -- again avoiding excessive costs. Finally, *control and evaluation of both programs and operation,* with the attendant "feedback" required, are perhaps the element of good management that above all calls for a centralized operation. Only thus can it be assured that results generated are those for which the programs are planned; only thus can the possibility be avoided that one program will act detrimentally on another without evidence to indicate a problem. The centralized structure has immediate access to all control records and all data required if the information system is to serve effective management decision-making. Such factors as these can make the difference between success and failure in the business/managerial end of continuing education.

Consolidating costs -- avoiding the possibility that fee income will be diverted to finance other departmental budgetary needs -- and assuring maximum cost effectiveness -- through these means the centralized structure *can devote more of the available dollars of funding to actual programming.* These extra dollars can turn the whole operation around from dependence on "what the public will buy" to the highest level of academic programming the institution can provide.

So much for the managerial perspective. But, perhaps even more importantly, there is the question of how well served by centralization, too, is the *educational perspective.*

As mentioned earlier, curriculum planning for the adult public community focuses on differenct objectives than those in the degree-oriented campus program, and the planners and implementers of continuing education must be thinkers who deal with the phenomenological view of the world rather than with the disciplinary view. It is on this premise that the concept of the centralized continuing education structure is primarily based. Such an integrated structure should constitute for the college/university faculty and the campus schools, colleges and departments, a semi-permeable membrane which allows forces to flow both ways, out toward and in from the adult community. The extension or continuing education division thus becomes the faculty's window to the world.

The campus faculty are the generators of new academic data -- the pilots of the new information through its experimental stages -- the initial validators of its worth. They deal with the discipline's data base -- the cognitive issues -- the intensive learning within the discipline in which they are the ultimate specialists in knowledge.

But if the job of continuing education is to have real meaning for the outside community, it must be seen from both the academic and the community viewpoint.

The specific role of the continuing education specialist is the generator not of academic data, but of academic learning experiences oriented to the phenomena of society. These encompass the following personal and career needs:

1. professional, paraprofessional, or vocational advancement, including the setting or resetting of life goals and the means of achieving them, and the creation of new careers;
2. human interrelationships and the place of humanity in the universe;
3. governmental functions at all levels, in local, state, national and international affairs;
4. and the multi-disciplinary, often multi-professional approaches required for public and private value judgment and decision-making in the great life issues of the day.

No statement is intended here to the effect that campus schools, departments and faculty do not have great contributions to make to continuing education. It is intended rather to make the case that through the centralized continuing education structure the best of both worlds -- campus and extension -- can most effectively contribute to nurture and enhance the quality of human life for the adult community beyond the campus.

More about the role of campus faculty will be discussed under my next topic, which is:

Staffing of the Continuing Education Operation

It is difficult to generalize concerning staffing, in view of the great range in size, and great varieties of funding patterns, among institutions offering continuing education programs. However, a few key points can be made with the understanding that infinite variations of them are possible.

1. Perhaps nowhere more than in a continuing education operation is the concept of "participative management" more valuable. While a central source of authority -- probably a dean or director -- must exist for final decision in conflict situations, regular meet-and-confer sessions of all key staff are essential. These would include top administrative personnel, heads of all academic programming units within the extension operation, and heads of all support departments. Only if all understand and support the mission, goals and objectives of the operation as a whole, can the finest quality "academic product" be achieved on the most cost effective basis.
2. Some of the essential qualities of extension academic staff, that is the continuing education specialist, were discussed earlier. Elaborating: the highest-and-best candidate would probably be both a specialist in a given academic field and a generalist in adult higher education. He or she would in addition have to have capabilities in program budgeting and other aspects of cost accounting procedures; in personnel supervision; in faculty, student, and general public relations; in marketing and promotional concepts. And above all, the specialist must have the qualities mentioned earlier, that is, the interdisciplinary and community-oriented viewpoint, plus the awareness of and ability to forecast potential great societal issues and trends and resultant learning needs of the professional and general public audience.
3. Concerning support staff, this again depends on the size and extent of the operation. Minimally, the needs include at least one person with professional training and experience in financial planning; one with expertise in federal , state and local legislation with respect to education, the rights of students, the rights of employees, affirmative action programs and other aspects of the operation; one with background in contract and grant and other extramural funding through public and private agencies; and one with sound knowledge of the marketing, advertising and general promotional fields. This last cannot be emphasized too strongly, for three reasons: (a) the need for effective market research to seek out potential new program area needs, such as for example new paraprofessional careers; (b) the need for effective dissemination of information to appropriate audience elements of programs offered by the extension division; and (c) the need for "tracking," or follow-up evaluation of promotional activities and of effectiveness of programs in achieving results desired.
4. Finally, concerning instructors for continuing education programs. What is essential to keep in mind here is that in continuing education, the focus shifts from "teaching" to "learning." The highest-and-best instructors of adults are those especially gifted faculty who are not only experts in their own academic fields, but can also relate those particular disciplines into interdisciplinary or multi-disciplinary contexts and can achieve, together with their students, a learning experience in the application of academic knowledge to life beyond the campus world.

For continuing education to succeed fully it is absolutely essential to have commitment on the part of the campus faculty. One of the important tasks of the continuing education division is to maintain such commitment, through acquainting faculty with the multitude of opportunities available to them through participation in extension activities. There is the potential for rapid transmission of scholarly research to professional groups. There are the challenges in teaching and learning for mature adult students; in cross-disciplinary programs with faculty in other departments; in joint development, with extension staff and community audience groups, of new kinds of course content, formats and methodologies in forefront areas of learning. There is also of course the enticement of additional income, or in cases where extension teaching is part of the faculty member's regular assignment, additional recognition. There are the contract or grant possibilities for research in such areas as learning motivation in adults; impact of social service programs; studies in the application of multi-professional expertise to national issues and problems.

In addition to its own campus faculty, the extension division's program is often enhanced by the use of faculty from other institutions of learning, and by instructors drawn from the community, such as for example, those in scientific and other professional practice, and in the creative and performing arts.

So much for the basic staff components of a continuing education operation. But in an operation of any size a variety of adjunct activities are also important, requiring staff with other areas of expertise. These include:

1. Student advisory or counseling services, ranging over such areas as the applicability of continuing education study to various degree programs around the country; the complexities of relicensure in professional and paraprofessional fields; career opportunities in the local community, and the potential for long or short-term study for new careers.

2. Some form of Management Information System, whether within the extension division or through affiliation with local computer facilities, where an appropriately written program can supply the data essential for effective management decision-making.

3. And finally, again either within the continuing education staff or through association with an outside agency, there must be access to expertise in today's vast networks of telecommunications. I will not elaborate on this aspect, since many of you in the audience are likely better versed than I, especially in the field of teleconferencing programs. What is important to note for every continuing education specialist or administrator, however, is the degree to which -- through the media/telecommunications methodologies that can vault space and time -- we can now bring together the sources of knowledge and the people who seek it. Thus, the knowledge within the institution of learning and the knowledge "out there" in the community can be brought together with those who seek it from the farther regions of a state -- or the farthest reaches of the world. I would add to Marshall McLuhan's comments in "The Medium is the Message," the fact that the content of telecommunications -- or at least a very large share of the content of telecommunications -- is continuing education.

One other area in the administration of continuing education that should be noted is:

The Financing of Continuing Education

Again, the patterns vary so widely that it is difficult to generalize. Some states contribute heavily to adult extension study -- others (including my own state of California) not at all. Complex factors are involved. There is the increasing stand among taxpayers that the limit has been reached -- that there will be no more money from the surcharged and overcharged middle class for the funding of free rides. Adults, so this group claims, should be able to pay for their own study. To a great extent this is true, at least in the professional and other career fields, where either direct reimbursement by the employer or brownie points for career advancement redound to the student who completes credit study or study toward the continuing education unit -- that is, the non-credit CEU.

On the other side of the fence, however, is the nagging knowledge that, except where study is thus reimbursed, unless there is government support of adult study, we can serve only "the rich" -- only those who can afford to pay the high fees that must be charged for a self-supporting continuing education operation.

One bright element in the outlook is the growing acceptance, among institutions of higher learning, of continuing education as a priority equal to research and undergraduate/graduate instruction -- a farewell to the marginality it has had in the past. And the national need for personal and professional adult study has brought growing awareness and recognition at the highest levels of public life, culminating in the significant recent achievement of the National University Extension Association. Representatives of this association, generally known as NUEA, worked with Senator Walter Mondale to bring about the drafting and passage of the Lifelong Learning Act as part of the Higher Education Act of 1976 -- legislation that will make possible the expansion of study for disadvantaged groups in our society, as well as application of educational expertise to local urban and regional problems.

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At the annual conference of this association -- NUEA -- which was held last month in Tucson, I was awarded the great privilege of serving for the forthcoming year as the association's president. I'd like now to conclude this talk on administering continuing education with the same thoughts that came to me as I stood on the podium at the NUEA conference, thanking the membership for the confidence they had placed in me. That is, that probably the single most important concept for the administrator of adult study programs is recognition of the tremendous influence and power of continuing education in America today -- and dedication to the principle of using whatever resources we have, for the greatest benefit of those 25,000,000 who look to us for lifelong learning.

MARKETING LONG DISTANCE LEARNING IN A NEW AGE

R. L. GOODHART, PROGRAMMING COORDINATOR
DIVISION OF UNIVERSITY OUTREACH
UNIVERSITY OF WISCONSIN, LA CROSSE

EDUCATION TODAY HAS COME INTO A BUYER'S MARKET. THERE ARE, CLEARLY, TRENDS AWAY FROM TRADITIONAL COURSES AND PROGRAMS IN FAVOR OF ACTION-ORIENTED STUDY. CAREER EDUCATION AND PERSONAL SELF-FULFILLMENT COURSES SUCCEED WHERE GENERAL INTEREST PROGRAMS DO NOT, FORMATS AND HOURS ACCOMMODATE WORK SCHEDULES AND PERSONAL PLEASURES. THE REASONS AREN'T DIFFICULT TO IDENTIFY: THE MEDIAN AGE OF PERSONS IN THE UNITED STATES IS NO LONGER THE TRADITIONAL COLLEGE AGE, BUT FROM 25 TO 32. SMALL COLLEGES SIMPLY WILL RUN OUT OF STUDENTS SOON IN THE 18-22 YEAR OLD CATEGORY. OUR PART-TIME ENROLLMENT WILL, IF IT HASN'T ALREADY, SURPASS FULL-TIME ENROLLMENT IN THE NEAR FUTURE.

AND AS PERSONS BECOME OLDER, THEIR NEEDS CHANGE, INCLUDING THOSE FOR CONTINUING EDUCATION. IF WE ARE TO REMAIN IN BUSINESS, WE NEED TO DEVOTE GREATER EFFORTS TO BUILDING PROGRAMS FOR THESE PEOPLE. AND AS LIFE-SUSTAINING PROSPECTS FOR OUR INSTITUTIONS, THERE IS LITTLE DOUBT ABOUT THE IMPORTANCE OF OUR FUTURES. WE ARE BEING CALLED UPON TO SUPPLANT FULL-TIME DEGREE PROGRAM COURSES WITH A VARIETY OF NEW LEARNING OPTIONS, NOT MERELY WITH AN EXTENSION OF EXISTING PROGRAMS WHICH WERE DESIGNED WITH YOUNGER STUDENTS IN MIND. NOR WILL TRADITIONAL FACULTY FROM OUR CAMPUSES ALWAYS BE THE MOST APPROPRIATE SOURCE OF THIS NEW LEARNING; AS PERSONS AND ORGANIZATIONS FIND NEW REQUIREMENTS UPON THEMSELVES, THEY WILL SPECIFY WITH THEIR RESPONSE TO OUR PROGRAMS WHETHER THE DELIVERY IS ACCEPTABLE. SIMPLY PUT, OUR AUDIENCE IS BECOMING MORE SELECTIVE, MORE FOCUSED, MORE PURPOSEFUL AS THEY CONTINUE THEIR EDUCATIONS.

IN MY PART OF WISCONSIN, MANY PEOPLE DON'T KNOW ABOUT TELECONFERENCE PROGRAMS, BUT THEY'RE LEARNING. IT IS BECOMING RECOGNIZED FOR WHAT IT IS--AN OPTION, AN ALTERNATIVE TO TRADITIONAL LECTURE-DISCUSSION CLASSROOM EXPERIENCES. LIKE THE PROVERBIAL ICEBERG, ONLY THE TIP OF THE POTENTIAL IS VISIBLE FOR DELIVERING TELECONFERENCE PROGRAMS DIRECTLY TO PEOPLE, WHEREVER THEY ARE. WE CANNOT FURNISH INSTRUCTORS PROFICIENT IN TEACHING HIGHLY SPECIALIZED ON-SITE COURSES ANY MORE: THEY MAY REQUIRE INSTRUCTORS WHO CAN BE FOUND ONLY A FEW PLACES WITHIN THE STATE; FURTHER, THOSE WHO ARE IN DEMAND OFF-CAMPUS ARE LIKELY IN GREAT DEMAND ON-CAMPUS AS WELL.

TELECONFERENCE PROGRAMMING WILL SERVE US IN SEVERAL WAYS TO FOCUS ON ADULT LEARNER DEMANDS: 1) TELECONFERENCING AND LONG DISTANCE SYSTEMS CAN DELIVER PROGRAMS FOR WHICH WE DO NOT HAVE LOCAL FACULTY OR EXPERTISE. 2) LONG DISTANCE LEARNING PATTERNS CAN REACH PEOPLE MORE CONVENIENTLY, CONSUMING LESS PARTICIPANT TIME. 3) TELECONFERENCES WILL MAKE INSTRUCTION AVAILABLE WHERE TRAVEL DEMANDS WOULD BE PROHIBITIVE. 4) SPECIALIZED PROGRAMS CAN SUPPLEMENT OTHER CURRICULA OFFERED FROM OUR CAMPUS, MAKING POSSIBLE COMPLETION OF CERTIFICATE OR ASSOCIATE DEGREES WHERE PARTICIPANT TRAVEL TIME WOULD DEFEAT THE EFFORT.

OF COURSE MARKETING THESE PROGRAMS TODAY PRESUMES ONE'S AWARENESS OF PREVIOUS RESPONSE TO DEMAND. IT ALSO REQUIRES GREATER SOPHISTICATION IN THE DEVELOPMENT OF PROMOTIONAL EFFORTS AND OF SPECIALIZED MEANS FOR RELATING PEOPLE WITH PROGRAMS. EXPERTISE IN MARKETING AS A SOCIAL SCIENCE HAS RISEN METEORICALLY, AT APPROXIMATELY THE SAME SPEED AS THE RISE IN IMPORTANCE OF THE COMPUTER. AS LONG-DISTANCE LEARNING INCREASES AND OUR KNOWLEDGE OF HOW TO PROMOTE MORE SPECIALIZED PROGRAMS DEVELOPS, MARKETING WILL BECOME OF EVEN GREATER NEED TO CONTINUING ADULT EDUCATORS.

MARKETING AS A MAJOR FOCUS

IN ORDER TO HELP WITH THE EXPANSION OF PROGRAMS FOR ALL PERSONS IN OUR COMMUNITIES, THERE NEEDS TO BE CREATIVE INPUT AT THE PLANNING STAGE USING WHAT WE KNOW ABOUT THE PEOPLE AND GROUPS FOR WHOM PROGRAMS ARE BEING PLANNED. WE MUST TALK WITH PROGRAMMERS ABOUT DEMAND AND NEED, NOT JUST SUPPLY GOODS AND SERVICES IN AN EDUCATIONAL SETTING. WE CANNOT JUST "SELL" A PRE-DEVELOPED PRODUCT ANY LONGER; OUR KNOWLEDGE OF AUDIENCES REQUIRES THAT WE HELP CREATE PROGRAMS ACCORDING TO THE NEEDS AND INTERESTS OF PEOPLE, THAT WE ASSIST IN PLANNING THE PRESENTATION SO THAT OTHERS WILL ACCEPT IT, AND THAT WE SHARE WITH OTHERS WHAT HAS BEEN DEVELOPED. IN SHORT, WE ARE BECOMING MARKETING SPECIALISTS AS A PREREQUISITE FOR MAINTAINING OUR MISSIONS; WE MUST TARGET THE MARKET FOR SPECIALIZED COURSES AND PROGRAMS, AND WE MUST OVERSEE THE GROWTH OF LEARNING IN AN ARENA ONLY RECENTLY RECOGNIZED IMPORTANT BY OUR ADMINISTRATIONS.

THE WORD "SELL" IS STRONG FOR TODAY; IT IMPLIES THAT WE HAVE NO HAND IN PREPARING, OR AT LEAST HELPING ORGANIZE, WHAT IS TO BE TAUGHT. THE PERSON WHOSE TASK I HAVE JUST DESCRIBED, HOWEVER, IS VITAL IN OUR BUSINESS TODAY. THE MARKETING SPECIALIST CAN ANALYIZE, PLAN AND PROMOTE--DEVELOP WITH OTHERS LEARNING PROGRAMS CONSISTENT WITH WHAT PEOPLE WANT TO KNOW MORE ABOUT, AND THEN SECURE THE ATTENTIONS OF THOSE WHO SHOULD KNOW ABOUT THE PROGRAMS.

MORE THAN THE TASKS BEING NEW THOUGH, IT IS THE PERSPECTIVE, THE CONCEPT OF A FOCUSED EFFORT IN ATTENDING TO OUR PRODUCTS THAT IS NEW, AN IMPORTANT CONNECTOR LINK BETWEEN PROGRAM DEVELOPMENT AND SUCCESSFUL LEARNING SITUATIONS.

THE FACT IS, OUR PAST EFFORTS MOSTLY "ANNOUNCED" PROGRAMS, ARRANGED FOR CLASSROOM SPACE SOMEWHERE, IDENTIFIED AN INSTRUCTOR, THEN REGISTERED PERSONS WHO APPEARED. HAVE WE PURSUED A PROMOTIONAL PLAN AS AGGRESSIVELY AS WE MIGHT? HAVE WE AGGRESSSIVELY PURSUED THOSE WHO MIGHT BE INTERESTED IN CONTINUING THEIR EDUCATIONS OR SPECIALTIES BUT WHO MAY NOT KNOW ENOUGH ABOUT US OR OUR PROGRAMS? I THINK NOT. WE NEED SPECIALISTS IN THE TOTAL MARKETING EFFORT WHO CAN CONTRIBUTE TO EVERY PHASE OF BRINGING PROGRAMS TO PEOPLE.

IDENTIFYING THE NEW MARKET STUDENT

THE MARKETPLACE IS EXPANDING. NEW PRODUCTS, SERVICES AND DEMANDS UPON TIME MAKE PEOPLE LESS LIKELY TO CONSIDER THEMSELVES IN THE PART-TIME EDUCATIONAL ENTERPRISE. FURTHER, KNOWING THE NEEDS OF A PUBLIC OR GROUP ISN'T ENOUGH; DO THEY REALIZE THE NEED? ADMITTEDLY, WE HAVE LITTLE EXPERIENCE TO DATE WITH ACTUALLY "MEETING NEEDS," A TERM OFTEN USED, SINCE NEEDS ARE SO DIFFICULT TO IDENTIFY. WHAT WE CAN DO IS TARGET AND ANALYZE PUBLIC NEEDS WHICH FIT OUR INSTITUTION'S TALENT CAPABILITY AND MISSION. (AND, I SHOULD ADD, NOT FORGET OUR CONTINUAL NEED TO ANALYZE EFFECTIVENESS OF CURRICULA, ACADEMIC PROGRAMS, COURSE OFFERINGS WITHIN

DEPARTMENTAL UNITS WITH WHOM WE MUST WORK.)

PART-TIME ADULT STUDENTS ARE THE NEW MAJORITY AFFECTING OUR MARKETING CONTINUING EDUCATION AND WILL INCREASE THEIR INFLUENCE IN THE FUTURE, INCREASING THE NEED FOR MORE COMPLEX MARKETING TACTICS BY WHICH WE CAN REACH THOSE PEOPLE AND GROUPS WITH APPROPRIATE SERVICES. NO LONGER WILL WE BE ABLE TO "ANNOUNCE" PROGRAMS AND SIT BY TO WAIT FOR REGISTRATIONS TO COME IN. IDENTIFYING GROUPS, THEIR NEEDS, INTERESTS, AND INCLINATIONS MUST COME FIRST. MAJOR AMONG THOSE GROUPS, WE HAVE IDENTIFIED MINORITIES, OLDER STUDENTS AND RETIREES, WOMEN, RETRAINING CANDIDATES, PLANNED-OUTS, EXTENDED DEGREE PEOPLE, PUBLIC SERVICE CLIENTELE, PROBLEM-SOLVERS, HUMAN SERVICE WORKERS AND NEW, ASPIRING ADULTS. NO ONE DENIES THERE IS A NEED FOR PROGRAMMING; HOW WE CAN IDENTIFY PEOPLE, THOUGH, PRESSES THE NEED FOR MORE SOPHISTICATED MEANS FOR MARKETING THE PROGRAMS WE HAVE OR CAN BUILD.

FUNCTIONS OF MARKETING LEARNING PROGRAMS

THE REASON FOR OUR COMING INTO THE MARKETING EFFORT, I PRESUME, IS TO LET PEOPLE KNOW HOW WE CAN FIGURE IN THEIR LIVES--TO COMPETE, IN A WORD, WITH THE MORE PASSIVE, LESS CONSTRUCTIVE ACTIVITIES WHICH VIE FOR EVERYONE'S TIME. AND FACE IT, TIME IS THE FACTOR IN SCARCE SUPPLY. IF WE HAVE A GOOD PROGRAM, OR TALENT TO DEVELOP ONE, WE MUST "MARKET" THE FACT. OUR FUNCTION IS TO SERVE PEOPLE WITH MORE AND BETTER PROGRAMS IN *professional development* TO HELP ADVANCE IN A JOB, DEVELOP AN AVOCATION, DEEPEN AN UNDERSTANDING, MAKE MID-LIFE CAREER CHANGES, OR IN *personal enrichment* LEARNING RELATED TO ONE'S HOME LIFE, CULTURAL APPRECIATION, LEISURE TIME ACTIVITY OR HUMAN RELATIONSHIPS.

TRADITIONALLY, WORK IN CONTINUING EDUCATION HAS INVOLVED THE PART-TIME CONCEPT, FOR ADULTS MOST OFTEN SUSTAIN JOBS AND DUTIES UNRELATED TO THE ROLE OF DEGREE-SEEKING STUDENT. THAT IS IMPORTANT TO MY FUTURE COMMENTS SINCE IT IS THE PART-TIME STUDENT WHO IS MOSTLY A PART-TIME (FULL-TIME?) SOMETHING ELSE TO WHOM I REFER.

SOME ASSUMPTIONS ABOUT MARKETING LEARNING

SOME THINGS WE KNOW AND CAN TRANSFER FROM CAMPUS-BASED TO LONG DISTANCE LEARNING:

1) PEOPLE WILL LEARN WHAT IS REQUIRED, DESIRED, OR NEEDED BY SOCIETY.
2) PART-TIME LEARNERS CAN TOLERATE ONLY LOW LEVELS OF AMBIGUITY.
3) THE MATURE LEARNER HAS PURPOSE.
4) ADULTS ARE LIMITED WITH TIME AND RESOURCES.
5) PERSONS MUST BE READY TO LEARN.
6) THAT WHICH PEOPLE LEARN MUST BE VALUED EITHER PROFESSIONALLY OR SOCIALLY.
7) INSTRUCTING ADULT LEARNERS IS NOT EASILY ACCOMPLISHED BY ALL PROFESSORS, WHOSE MAJOR TASKS INCLUDE RESEARCH AND TEACHING FULL-TIME UNDERGRADUATE AND/OR GRADUATE STUDENTS.
8) MOST ANY ROLE OR DEMAND UPON PART-TIME LEARNERS CONFLICTS WITH THE ROLE OF STUDENT.
9) PRACTICING PROFESSIONALS MAY BE ABLE TO SATISFY ADULT LEARNER NEEDS MORE APPROPRIATELY THAN FULL-TIME INSTRUCTIONAL STAFF.
10) THAT WHICH PEOPLE NEED MAY NOT BE EVIDENT TO THEM.
11) FOCUS FOR LEARNING CHANGES WITH AGE AND CURRENT SITUATION.

I HAVE ALREADY ALLUDED TO OR MENTIONED SEVERAL OF THESE ASSUMPTIONS. IN ORDER TO ATTEND TO PROMOTION OF PROGRAMS FOR LEARNING BY LONG DISTANCE, THERE IS NOT SO MUCH NEED TO COMPLETE THIS LIST--WHICH IS INFINITE BECAUSE IT IS NOT CATEGORIZED--BUT TO RECOGNIZE THAT WE FACE SUCH PHENOMENA IN OUR WORK. I LIST THESE ONLY TO POINT OUT THAT WE MUST MAKE CERTAIN OF A NEED FOR PROGRAMS WHICH WE DEVELOP, AND THAT WE PLAN EXPERIENCES RELATED TO WHAT PEOPLE CAN ACCEPT, RATHER THAN RELATED TO WHAT WE THINK THEY SHOULD!

CREATING THE PRODUCT, PLANNING THE PROGRAM

ONE CANNOT PROMOTE A PRODUCT VERY WELL WHEN ITS DEMANDS DO NOT COINCIDE WITH AUDIENCE REQUIREMENTS LIKE THE ONES ABOVE. TAKE TIME; WHO HAS ANY EXTRA? WHO WILL VOLUNTEER AS MUCH AS OTHERS WOULD ACCEPT? TO HAVE IMPACT UPON PROGRAM DEVELOPMENT, MARKETING SPECIALISTS MUST IMPRESS UPON PLANNERS THE NEED FOR TIME UTILIZATION BECAUSE (NOW I CAN USE IT) IT SELLS. CAN WE PERSUADE MORE INSTRUCTORS TO TEACH THEIR SUBJECT IN CLASS SO THAT BUSY PEOPLE NEEDN'T RETURN HOME TO FIGURE OUT WHAT THE INSTRUCTOR MEANT THEN CORRELATE THAT WITH THE TEXT--WHICH IS WHAT THE TEST WILL COVER? IS THE TEXT ITSELF APPROPRIATE? ARE PROJECTS ASSIGNED RECOGNIZING PEOPLE'S EVERYDAY TASKS MAY BE SIMILAR? WE SHOULD KNOW WHAT PEOPLE ARE LOOKING FOR WELL ENOUGH TO HELP WITH THESE DECISIONS. I THINK OF IT ANOTHER WAY; IF I GUARANTEED SATISFACTION IN A COURSE THEN REGISTERED THE PEOPLE PERSONALLY AND ATTENDED EACH CLASS WITH THEM, WOULD I EXPERIENCE ANY DISCOMFORT BECAUSE OF BAD PLANNING? THERE ARE SUGGESTIONS WE SHOULD MAKE IN PLANNING, PERHAPS SOME DETAILS WHICH WE SHOULD EVEN INSIST UPON IN PLANNING PROGRAMS.

AS I SEE IT, OUR PROBLEM IS TO RELATE TO PEOPLE IN OUR PRIMARY SERVICE AREAS WITH VITAL, PROBLEM-SOLVING PROGRAMS, THE DEVELOPMENT OF WHICH WE PARTICIPATED IN, AND ALTERNATELY, TO DEVELOP PROGRAMS AS A RESULT OF ESTABLISHING SUCH RELATIONSHIPS. WE ALL SEE PROBLEMS IN PROMOTING PROGRAMS THAT WERE CREATED ELSEWHERE THEN HANDED TO US TO BROKER. IN ADDITION, WE HAVE DETAILS FROM CLIENT GROUPS REGARDING WHAT PEOPLE NEED OR WANT, WE HAVE SURVEYS OF FACULTY AND STUDENTS, REMARKS FROM COLLEAGUES, AND OUR OWN SENSE OF TIMING AND FOCUS. SELECTING AND DEVELOPING A PRODUCT NEEDS MARKETING SPECIALISTS. SOME OF THE WAYS WE CAN SERVE IN THAT ROLE INCLUDE:

1. TOPIC: THE TITLE--WHAT DOES IT SAY? I RECEIVED ONE RECENTLY; "CREATIVE DEVELOPMENT IN THE EXTENDED CLASSROOM;" IT DIDN'T RELAY MUCH MESSAGE ABOUT THE COURSE. PROBABLY MORE THAN ANYTHING ELSE WE HAVE FOUND THE NEED FOR CLEAR, SELF-EXPLANATORY TITLES. "PREVENTATIVE DENTISTRY: A COMMUNITY APPROACH" WAS VAGUE BUT PASSABLE. ONE THAT ILLUSTRATES MY POINT DEALT WITH A SHORT, THREE-SATURDAY MORNING BOTANY CLASS FOR COMMUNITY GARDEN CLUB GROUPS WHICH WE TITLED "SEEDS AND WEEDS OF FALL IN THE COULEE REGION." NO TELEPHONE CALLS ASKING ABOUT THE CONTENTS OF THIS ONE!
2. TIMES: CAN YOU SEE YOURSELF GETTING TO CLASS ON TIME? REGULARLY? IS THE STRENGTH OF A PROGRAM THAT ONE CAN ATTEND DIRECTLY AFTER WORK AND BE HOME BY 7 OR 8 PM? OR THAT IT BEGINS AT A TIME FOLLOWING THE FAMILY DINNER HOUR OR ATTENTION TO CHILDREN? FOR NURSES IN MY AREA, WE HAVE TWO MAJOR HOSPITALS, ONE

CHANGES SHIFTS AT 3PM, THE OTHER AT 3:30PM; CLASSES FOR NURSES BEGIN AT 4! WHATEVER THE TIME ALLOTTED, PLAN THE COURSE FIRST TO THE BENEFIT OF THE INTENDED AUDIENCE.

3. INSTRUCTOR: DOES A WELL-KNOWN PERSON HELP? YES, IF IT IS A GOOD, PROVEN EFFECTIVE INDIVIDUAL WHO IS, INDEED, KNOWN. STILL, TALENT IS MORE IMPORTANT; WE ADVERTISED A NATIONALLY FAMOUS EXPERT ON HEART AND STRESS FACTORS, EMPHASIZED HIS NAME, ONLY TO FIND MANY PERSONS DIDN'T KNOW WHO HE WAS. WHAT HE DID WAS TERRIFIC; BUT HIS FAME CAME BECAUSE OF HIS SPEAKING AND INSTRUCTIONAL ABILITY.
4. COURSE LENGTH: IN OUR AREA, THE BEST TIME FOR NON-TRADITIONAL COURSEWORK IS FROM LATE SEPTEMBER UNTIL DECEMBER. THOSE OF YOU ON THE QUARTER SYSTEM ARE MORE FORTUNATE THAN OTHERS OF US; THE FACT SEEMS TO BE THAT BUSY PEOPLE IN OUR AREA DON'T COMMIT THEMSELVES TO LONGER THAN SIX TO EIGHT WEEKS OF COURSES. MY LAST ETN SERIES WAS FIVE MONDAYS AND IT WORKED MOST SUCCESSFULLY. THREE SEMESTER CREDIT THREE-DAYS-A-WEEK FOR-FIFTEEN-WEEK COURSES USUALLY CANNOT MEET SCHEDULES OF OUR PART-TIME LEARNERS.
5. PRICE: SOMETIMES NOTHING MUCH IS POSSIBLE IN SETTING PRICE; MINIMUMS FOR BUDGETS MAY VARY FROM ON-SITE COURSES, HOWEVER, RESULTING IN LOWER COST-RECOVERY FIGURES. WHETHER WE APPROVE OR NOT, RELATING COSTS AND FEES TO OTHER PROFESSIONAL AND LEISURE TIME ACTIVITIES IN WHICH CLIENTS PARTICIPATE SEEMS TO AID IN MARKETING APPEAL. AND SOMETHING WE'VE RECENTLY BEGUN IN MOST COURSES: PRE-REGISTRATION AND PARTIAL FEE PAYMENT WHICH TAKES ADVANTAGE OF POSITIVE INTENTIONS AND ADDITIONALLY REDUCES THE IMPACT OF PAYMENT AT THE FIRST CLASS MEETING. BILLING FOR PAYMENT AND CHARGE CARDS ARE NOT YET PART OF OUR SYSTEM, PARTIALLY BECAUSE WE FEEL NON-TRADITIONAL ADULT LEARNERS IN OUR AREA WANT TO TAKE FISCAL RESPONSIBILITY FOR THEIR STUDY PROGRAMS.
6. OTHER FACTORS: CONSIDER REQUIREMENTS, OUTSIDE DEMANDS, TYPE OF RECOGNITION SYSTEM (CREDIT, CEU, SCHOOL BOARD UNITS, WORK INCENTIVE TRAINING PAYMENTS), MATERIALS TO BE FURNISHED; ALL ADD TO THE PACKAGE YOU CREATE AND PLAN OUT.

MARKETING THE EFFORT: THE MAJOR TASK

STILL OUR MAJOR CONCERN IS TO "GET THE WORD OUT." IN PROMOTING LONG DISTANCE LEARNING PROGRAMS, ONE MUST BE MORE ORGANIZED, HOWEVER; NO LAST-MINUTES POSTERS AROUND SHOPPING CENTERS OR GUEST SPOTS ON A LOCAL RADIO STATIONS. ONE IS DEALING WITH GREAT NUMBERS OF SQUARE MILES IN THIS PROMOTION EFFORT! YET AS WE ADOPT MORE DEPENDABLE TECHNIQUES FOR EFFECTIVELY ANNOUNCING OUR PROGRAMS AND CAPABILITIES, CERTAIN MORAL AND ETHICAL QUESTIONS ARISE FROM ADMINISTRATORS AND FACULTY WHO HAVE YET TO RECOGNIZE OUR NEED FOR NEW GUIDELINES WHICH SHARPEN PROGRAMMING EFFORTS. MOST QUESTIONS WILL IMPLY SELLING AND MARKETING TO BE SYNONOMOUS, THAT MARKETING MEANS MANIPULATION, PLACING UPON US THE BURDEN OF PROOF THAT LEARNING IS STILL FOREMOST AND THAT WE ARE DELIVERING PERSONAL AND PROFESSIONAL GROWTH EXPERIENCES TO PEOPLE INTERESTED RATHER THAN COERCED INTO ATTENDING. LIKE THE OLD JOKE, FIRST WE MUST GET THEIR ATTENTION.

BEFORE DISCUSSING SOME TECHNIQUES WE CAN USE IN OUR EFFORTS, ALLOW ME A WARNING OR TWO: I'VE SUGGESTED A CENTRAL OFFICE FOR PERFORMING MARKETING FUNCTIONS, BUT IF WE CANNOT PERFORM AN EFFECTIVE JOB OF IT, INDIVIDUAL DEPARTMENTS MAY BEGIN ON THEIR OWN, POSSIBLY WITH OVER-ALL ADVERSE EFFECTS UPON THE IMAGE OF THE INSTITUTION. SO THE DILEMMA: TO DO OUR JOB WELL, WE NEED TO BECOME MORE REFINED; IF WE REFINE NEEDS ANALYSIS, PROGRAM PLANNING, MARKET SEGMENTATION AND EVALUATION, WE STAND THE CHANCE OF BEING ACCUSED OF SUBVERTING TRUE EDUCATIONAL EFFORT; YET IF WE DON'T, WE MAY LOSE OUR CENTRAL FUNCTION TO PERSONS WHOSE REASONS FOR TEACHING OUTWEIGH THEIR INTEREST OR ABILITY IN THE MARKETING EFFORT! PLAINLY, MARKETING TECHNIQUES NEEDN'T "SELL," BUT ARE BECOMING INDISPENSIBLE THOUGH IN HELPING US REACH PEOPLE WHO WANT CONTINUING EDUCATIONAL EXPERIENCES. WE NEED TO PRACTICE THOSE TECHNIQUES THAT HELP US COMPETE SUCCESSFULLY FOR THE ATTENTIONS OF BUSY ADULTS WHO NO LONGER ENJOY THE LEISURE TIME WE LOOKED FORWARD TO FILLING FOR THEM. ANOTHER QUALIFICATION WHICH I MUST MAKE REGARDS COMPUTER APPLICATION; EACH CONTINUING EDUCATION UNIT SHOULD BE ABLE TO ARRANGE FOR PROGRAMS TO ASSIST IN RECORD-KEEPING, ADDRESS FILING, USE RUDIMENTARY TRACKING SYSTEMS AND BUDGETARY MANAGEMENT OF ITS SCHEDULE OF ACTIVITY. AS ACCOUNTING IS THE FOUNDATION FOR MOST BUSINESS, THESE COMPONENTS ARE BECOMING VITAL TO GOOD LONG DISTANCE PROGRAMMING AND TO ADULT CONTINUING EDUCATION IN GENERAL. FINALLY, ALL THIS MUST BE PLACED IN COST EFFECTIVE PLANS; THAT IS, WE CAN'T TAKE MUCH TIME SINCE MARKETING SPECIALISTS ARE SERVICE ORIENTED FIRST, PRODUCT ORIENTED SECOND.

MARKETING DEFINED--AGAIN

PHILIP KOTLER, IN HIS MARKETING FOR NON-PROFIT ORGANIZATIONS, DEFINES MARKETING AS EFFECTIVE MANAGEMENT BY AN ORGANIZATION OF ITS EXCHANGE RELATIONS WITH ITS PEOPLE AND GROUPS (P. X, PRENTICE-HALL, 1975). BUT WHERE DOES ONE, PRACTICALLY SPEAKING, GO FROM THERE? HERE ARE SOME OF THE COMPONENTS WE PARTICULARLY NEED TO ATTEND TO IN A MARKETING PROGRAM:

IN EVERY INSTANCE, WE MUST *EVALUATE* WHAT WE HAVE--MARKETERS OF LONG DISTANCE LEARNING HAVE TWO AUDIENCES TO SERVE: THE PUBLICS AND GROUPS FOR WHOM PRODUCTS ARE DEVELOPED AND OUR INSTITUTIONAL RESOURCES.

A. INSTITUTIONAL EVALUATION: WHAT IS THE EXPERIENCE OF THE FACULTY? DO FACILITIES PROVIDE NECESSARY RESEARCH AND DEVELOPMENT? ARE RESOURCES AVAILABLE FOR CREATING, DEVELOPING AND PRESENTING PROGRAMS FROM THE INSTITUTION? WHAT IS THE INSTITUTION IMAGE IN THE FIELD UNDER CONSIDERATION? WHAT IS THE NATURE OF ADMINISTRATIVE SUPPORT FOR THE PROGRAM? DOES THE SCHOOL MISSION PERMIT SUCH PROGRAMMING? WHAT ARE THE UNIQUE ADVANTAGES OF THE UNIT FOR PERFORMING THE PROGRAM THROUGH YOUR INSTITUTION? WHAT ARE THE RESTRICTIONS, WEAKNESSES, REASONS FOR NOT DEVELOPING THE PROGRAM?

B. MARKET EVALUATION: HOW GOOD ARE OUR PRODUCTS TO OTHERS? DO OUR PROGRAMS COMPETE FOR PEOPLE'S ATTENTION? WHERE DO PEOPLE WORK? WHAT DO THEY DO? HOW CAN WE FIND THEM? ARE THERE ENOUGH PERSONS INTERESTED? IS THE SERVICE ALREADY BEING PROVIDED? WHAT DO OUR CONSTITUENCIES NEED? IS IT POSSIBLE TO DEVELOP NEW MARKETS BY EXPANDING A SERVICE AREA? NUMBER OR TYPE OF PRODUCT? HOW AND WHY DO PEOPLE RESPOND TO ADDITIONAL EDUCATIONAL PRODUCTS OR SERVICES?

MOST IMPORTANT, ONE MUST RECOGNIZE CONDITIONS--THOSE WITHIN OUR CONTROL AND THOSE BEYOND OUR CONTROL. IF WE FIND FROM QUESTIONING THAT CRUCIAL FACTORS LIE BEYOND OUR REACH, PROGRAMMING EFFORTS SHOULD BE REDIRECTED AND MARKET GROUPS TARGETED MORE SPECIFICALLY BY OTHER MEANS.

PROMOTION, THE ACTUAL PROCESS OF GETTING OUT THE WORD, INVOLVES SEVERAL ADDITIONAL STEPS:

C. PROMOTION PLANNING: WHAT ARE THE GOALS OF THE PROGRAM? WHAT IS THE DESCRIPTION? WHAT MEANS DO WE HAVE FOR REACHING OUR PUBLICS? WHAT IS THE BUDGET? (ARE ALL COSTS INCLUDED?) WHAT IS THE PREDICTION FOR RESPONSE? WHAT ARE THE RESPONSE GOALS? ARE THERE ARRANGEMENTS FOR EFFECTIVE FOLLOW-UP AND FOLLOW-THROUGH? WHAT IS THE TIMETABLE? WHO WILL BE INVOLVED? WHAT WILL EACH DO?

D. MARKET SEGMENT CRITERIA: WHAT DEMOGRAPHIC INFORMATION IS AVAILABLE FROM WHICH WE CAN WORK? WHAT AREA PROFILES CAN WE EXAMINE FOR POLITICAL, HISTORIC, GEOGRAPHIC, ECONOMIC, EDUCATIONAL, AND PROFESSIONAL DATA RELEVANT TO OUR PLANNED PROGRAM? ARE THERE PARTICULAR LIFESTYLES WE CAN IDENTIFY AND APPEAL TO? IS CENSUS AND GOVERNMENTAL INFORMATION AVAILABLE ON THE POPULATION WE HAVE IDENTIFIED?

E. MAILING LISTS SELECTION: ARE LISTS OF PERSONS AND GROUPS AVAILABLE FOR THOSE AREAS, POPULATIONS, PROFESSIONS, ETC. SELECTED? FROM PREVIOUS ENROLLMENT LISTS? FROM OTHER INSTITUTION SOURCES? FURNISHED BY GROUPS? EXCHANGED? PURCHASED? DEVELOPED?

F. MEDIA EXPOSURE STRATEGY: WHAT MEDIA MIX WILL BEST SERVE? WHAT ARE THE CRITERIA FOR SELECTION OF MEDIA? WHAT MEDIA ARE BEING OMITTED? WHY? WHAT SOURCES OF PUBLICITY CAN BE OBTAINED FREE OF CHARGE? WHAT SOURCES OF ADVERTISING? ARE TRADE OR IN-HOUSE PUBLICATIONS AVAILABLE? CHAMBERS OF COMMERCE, ORGANIZATION, CLUB, CHURCH, BUSINESSES' NEWSLETTERS AND ANNOUNCEMENTS? WHAT PREVIOUS EFFORTS SUCCEEDED BECAUSE OF A PARTICULAR MIX? WHY DID ANY FAIL?

G. MARKET CONTACT SELECTION: WILL DIRECT MAIL GO TO INDIVIDUALS OR TO MEMBERS OF GROUPS? BOTH? IS THE MAILING PIECE RELEVANT TO THE AUDIENCE? ARE GROUP REPRESENTATIVES CONTACTED? WILL THE POSTAL PERMIT RATE ALLOW UNIQUE MAIL CONTACT? WHEN WILL FIRST CLASS PERSONAL LETTERS BE OF HELP? WHAT PERSONAL RESOURCES CAN BE CONTACTED TO ASSIST? ARE TELEPHONE FOLLOW-UP CALLS BEING PLANNED? WILL THE INSTRUCTOR OR MEDIA BE AVAILABLE FOR GROUP PRESENTATIONS, SHORT TALKS OR DEMONSTRATIONS? ARE REPRESENTATIVES TAKING TIME TO PERSONALIZE THE EFFORT WITH PERSONAL VISITS TO KEY INDIVIDUALS OR COMMITTEES? EVEN ON A STATE-WIDE BASIS, THEY CAN BE WORTH THE EFFORT.

FINALLY, CERTAIN *CONTROLS* ON THE ENTIRE OPERATION DELIMIT BOTH MEDIA EXPOSURE STRATEGY AND MARKET CONTACT SELECTION AS WELL AS OTHER TACTICS. THESE ARE THE FACTORS WHICH TEND TO CHALLENGE OUR CREATIVITY IN DEVELOPING AND MARKETING PROGRAMS IN A PROFESSIONAL, EFFICIENT MANNER. SOME ARE GIVENS, OTHERS I URGE YOU NOT TO OVERLOOK, MOST ARE BEYOND OUR DIRECT CONTROL AND SHOULD BE ACCEPTED IN ANY EVENT; ALL ARE THE KEY TO INCREASED SUCCESS WITH FUTURE PROGRAM EFFORTS.

H. PROGRAM BUDGETING: ARE DIRECT AND INDIRECT COSTS IDENTIFIED? IS THERE AN ACCOUNTING SYSTEM FOR KEEPING RECORDS OF TIME AND EXPENSES? ARE PRINTING, POSTAGE, TRAVEL AND OTHER PROMOTIONAL COSTS ESTIMATED ACCURATELY AND SUBSEQUENTLY AMORTIZED FROM PROGRAM REVENUE? ARE PROGRAMMERS AND INSTRUCTORS AWARE OF BUDGETS AND BUDGETARY RESTRAINTS? IS THERE AN ADEQUATE SYSTEM FOR CHARGING BACK COSTS AND EXPENSES TO THE PROGRAM ITSELF? ARE INSTRUCTOR PAYMENTS CONSISTENT WITH INSTITUTION POLICY? COMPETETITIVE?

I. COST ANALYSIS: ARE COSTS PER RESPONSE COMPUTED? COSTS PER ENROLLEE? DO STANDARD COSTS EXIST FOR POSTAGE, PRINTING AND PROMOTION? INSTRUCTIONAL MATERIALS? IS THERE COST ANALYSIS AND COMPARATIVE DATA FOR EACH PROGRAM? FOR EACH PROGRAM CATEGORY? BY TERM? ARE INDIRECT COSTS BEING COVERED FAIRLY BY EACH PROGRAM? WILL THERE BE ANY REVENUE ABOVE EXPENSES TO DEVELOP NEW EXPERIENCES?

J. COURSE RESPONSE ANALYSIS: WAS DATA COLLECTED FROM COURSE PARTICIPANTS? DID DEMOGRAPHIC, MARKETING, INTEREST, PREVIOUS PARTICIPATION, PRICING RESPONSE, AND PROFESSIONAL BACKGROUND INFORMATION GET COLLECTED AS WELL AS COURSE EVALUATIONS? WERE NEW OR ADDITIONAL TOPICS SUGGESTED? IMPRESSIONS READ FOR LEADS TO PROGRAM REFINEMENT?

K. FEEDBACK AND FOLLOW-UP: FINAL STEPS SHOULD ALWAYS BE MODIFICATION OF THE MARKETING EFFORT BASED ON DATA AND ANALYSES OBTAINED, INCLUDING THAT FROM STAFF MEETINGS AND REPORTS ON EFFECTIVENESS AND POSSIBLE CHANGES IN FUTURE DEVELOPMENT AND PROMOTION. IS A FILE WITH ALL DETAILS ASSEMBLED FOR FUTURE REFERENCE BY THOSE WHO PARTICIPATED IN DEVELOPMENT OF THE ACTIVITY? ARE COST SHEETS AND BUDGET MATTERS RELATED TO OTHER SUCCESS FACTORS? ARE SAMPLES OF PRINTED MATTER AND MEDIA RELEASES INCLUDED?

CONCLUSION

OUR MARKETPLACE IS EXPANDING; THE NEED FOR NEW LEARNING IS EVIDENT. TECHNIQUES FOR PROMOTING OUR EFFORTS MUST, HOWEVER, BE REFINED AND PERFECTED. IN AN AGE WHEN NEED CONFLICTS WITH GREATER SELECTIVITY AND INCREASED SPECIALIZATION MAKES DEMANDS FEW INSTRUCTORS CAN FILL, THERE IS EVERY REASON TO EXPECT LONG DISTANCE LEARNING TO BE IN THE LEAD, DELIVERING RESOURCES AND FULFILLING REQUESTS FOR PARTICULAR EDUCATIONAL SERVICES. TELECONFERENCING IS AS YET AN UNKNOWN TO MANY PERSONS WHO HAVE EVERY RIGHT TO LEARN FROM IT.

THOSE OF US WHO HAVE BEGUN THE EFFORT ARE PROBABLY MOSTLY FIRST GENERATION SPECIALISTS, NOT ORIGINALLY TRAINED IN THE MARKETING FIELD OR PERHAPS NOT EVEN IN THE AREA OF CONTINUING EDUCATION. BUT STILL WE'RE THERE, LEARNING AND BECOMING MORE KNOWLEDGABLE AND DEMANDING IN OUR APPROACHES TO CREATING AND PROMOTING LEGITIMATE CONTINUING EDUCATION PROGRAMS. SECOND AND THIRD GENERATION MARKETING SPECIALISTS IN EDUCATION WILL HAVE MAJORED IN THE AREAS WE'VE DEVELOPED: MARKET ANALYSIS, NON-PROFIT ORGANIZATION PROMOTION, ADULT PROGRAM PLANNING, ADULT EDUCATION, CONTINUING EDUCATION, AND OTHER AREAS NOT YET INVENTED. AND THEY WILL CONTRIBUTE FAR MORE GREATLY TO ACHIEVING WHAT WE SEE NEEDS DOING. THERE ARE RESOURCES TO BE SHARED WITH OTHERS WHO NEED THEM; SEEING THAT THEY ARE SHARED IS OUR JOB. WE'RE DOING WELL NOW; WE'RE LEARNING MORE EVERY DAY. THINK HOW WELL WE WILL SUCCEED WHEN WE KNOW WELL WHAT WE SHOULD BE DOING! THANK YOU.

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AUDIO TELECONFERENCING

TRANSMISSION SYSTEMS & CONSIDERATIONS

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AUDIO TELECONFERENCING
TRANSMISSION SYSTEMS & CONSIDERATIONS

R. W. Ruedisueli
A. T. & T. Co. Long Lines - GC
Washington, D. C.

INTRODUCTION

A brief definition; purpose of
the paper and how it is organized

Definition

Since this paper deals primarily with the transmission systems and considerations it seems fitting that the opening paragraphs should at least contain a brief definition of audio teleconferencing. Thus, in its simplest form let us consider audio teleconferencing to be an interaction of one individual, the conference originator, with two or more individuals, the conferees. Let us further state that such interaction be accomplished by some form of wire link such as a dedicated facility or a connection established over one or more switched telecommunication networks.

Audio teleconferencing may also be considered as the interconnection of two or more groups or assemblies by wire link allowing the simultaneous interchange of ideas of each conference. Finally in its more complex form audio teleconferencing may involve the interconnection by communication links of several individuals and groups interacting for a common cause.

Purpose

My main purpose however, is to present a discussion of the various transmission systems used to achieve audio teleconferencing. In addition it is my intention to address certain transmission parameters and considerations for controlling them in practical audio teleconferencing systems. It is not my intention to provide a mathematical analysis of the parameters but instead to show how each impacts quantitatively on the final system design, and what steps may be taken to control each.

Paper Organization

The paper is divided into four main sections. The first is a brief overview of audio teleconferencing. Readers already acquainted with audio teleconferencing systems may wish to proceed directly to the second section which deals more specifically with transmission systems. The third section deals with transmission considerations. Finally the paper concludes with some recommendations and a view of future audio teleconferencing trends.

OVERVIEW

A brief discussion of audio teleconferencing arrangements; modes of operation; methods of establishing teleconferences; and interfaces.

Conferencing Arrangements

The interconnection of three or more individuals by wire and/or wireless communications links is by no means a new concept. Multipoint private or dedicated networks have been around since the earliest days of telegraphy as well as telephony. Books have been written concerning such arrangements. The interconnection of assemblies of people through the marriage of specially treated conference rooms is a somewhat new concept, coming into focus more in keeping with the computer and space ages and fostered more recently by the energy crisis.

As stated in the introduction it is not the intention of this paper to dwell on the details of audio teleconferencing arrangements but rather to briefly describe some of the possibilities more as background for the uninitiated reader so as to make the subsequent discussion of transus by means of a series of scenarios review a few of the configurations. Methods of establishing audio teleconferences and how they are run, i.e. mode of operation, will be ignored for the time being but will be discussed later.

Room to Room. Mr. "A", an executive of Sales Promotions Inc. requests a meeting of his immediate subordinates to discuss a new product promotion scheme. Mr. "A" and staff meet in a conference room in City A. Mr. "A" and his staff wish to include in their discussion a Graphic Arts Company located at City B. Mr. "B" of Graphic Inc. assembles his staff in their conference room. The two rooms are linked together by a suitable communications link as pictured in Figure 1.

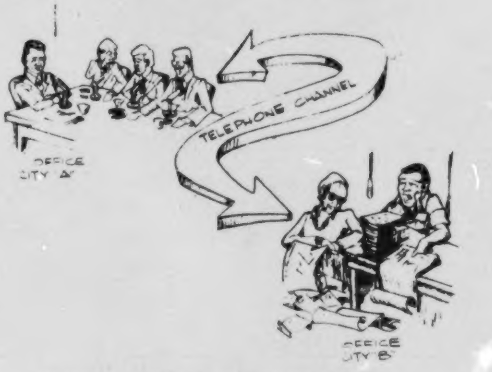

FIGURE 1. ROOM TO ROOM TELECONFERENCE

Room to Several Other Rooms. Mr. "A" of Sales Promotions Inc. next wishes to discuss the new promotion stunt with each of his regional offices, three in all. Since the comopany's transportation budget has been cut it is agreed that each of the regional teleconference rooms should be used. The five rooms are interconnected by communicatlions links as in Figure 2. Note, the addition of a bridge.

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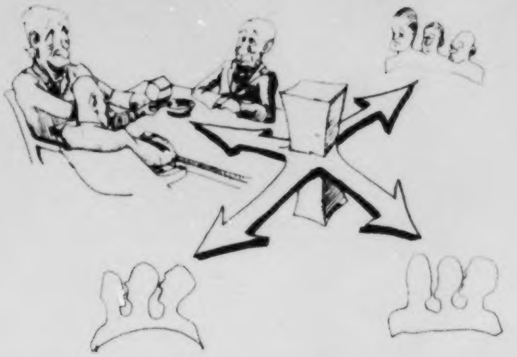


FIGURE 2. ROOM TO SEVERAL OTHER ROOMS TELECONFERENCE

Station to Several Other Stations. Having been appropriately motivated by Mr. "A" each of the regional managers are now faced with the responsibility of getting the new promotional package to each of the regional field offices. Station to station conferencing is used as pictured in Figure 3. Once again a suitable bridge is required as part of the communications link. More on this later.

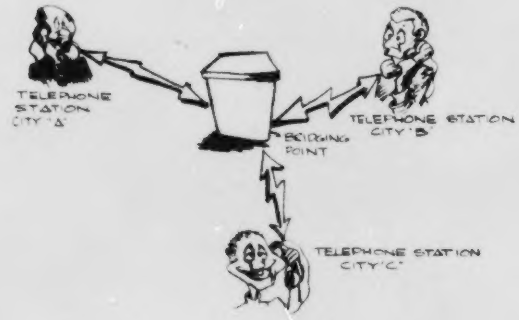

TELEPHONE STATION CITY "A"
BRIDGING POINT
TELEPHONE STATION CITY "B"
TELEPHONE STATION CITY "C"

FIGURE 3. STATION TO STATION TELECONFERENCE

Various Other Combinations. On another occasion Mr. "A" and his staff were assembled in their conference room which was connected to the regional office at City B. Two members of this region could not be physically present so they were added as pictured in Figure 4. One member was reached at his home while the other, who was on the road, called in from a pay station in City C.

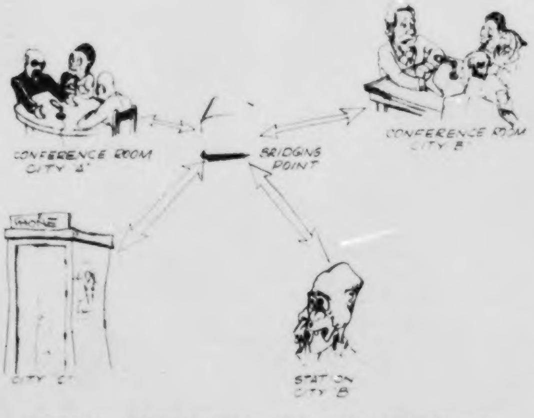
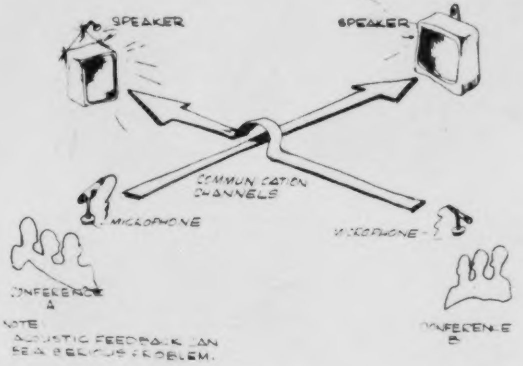

CONFERENCE ROOM CITY "A"
BRIDGING POINT
CONFERENCE ROOM CITY "B"
PHONE
CITY "C"
STATION CITY "B"

FIGURE 4. ROOM TO ROOM AND STATIONS TELECONFERENCE

Modes of Operation

Let us now focus our attention on another aspect of audio teleconferencing, the "modes of operation". Here an attempt is made to explain how the conferees depicted in the scenarios interact with each other. Ideally the audio teleconference system employed should allow complete vocal freedom (talker, listener activity) as in any normal verbal exchange. (Full duplex) Technical limitation may, on the other hand, limit this freedom allowing only one talker at a time (half duplex) and in still other cases the conference originator may choose to restrain interaction by "broadcasting" his thoughts or message. Consider the following.

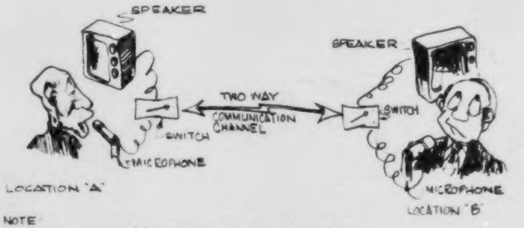
Full Duplex. The audio teleconference between Mr. "A" and his staff at headquarters and regions were full two way exchanges. The teleconference system employed could have been configured as shown in Figure 5. But, as indicated in the figure, acoustic feedback problems and the need for bridging in some instances results in technical limitations which imposed a more disciplined verbal exchange.


SPEAKER
SPEAKER
COMMUNICATION CHANNELS
MICROPHONE
MICROPHONE
CONFERENCE A
CONFERENCE B

NOTE:
ACOUSTIC FEEDBACK CAN BE A SERIOUS PROBLEM.

FIGURE 5. FULL DUPLEX TELECONFERENCE

Half Duplex. This more disciplined verbal exchange is depicted in Figure 6. The "talk, listen" switch may be operated either manually (push to talk) or automatically (voice actuated).


SPEAKER
SPEAKER
TWO WAY COMMUNICATION CHANNEL
SWITCH
SWITCH
MICROPHONE
MICROPHONE
LOCATION "A"
LOCATION "B"

NOTE:
WHEN LOCATION "A" IS SPEAKING, LOCATION "B" MUST BE IN "LISTENING MODE." IF LOCATION "B" WISHES TO TALK, HE MUST SWITCH TO "TALK MODE", AND LOCATION "A" MUST SWITCH TO "LISTENING MODE."

FIGURE 6. TWO-WAY HALF DUPLEX TELECONFERENCE

Broadcast. Quite frequently Mr. "A" of Sales Promotions Inc. chooses to make rather long presentations to his wide spread staff. On such occasions he does not wish to be disturbed by background noise at the outlying location. The broadcast mode pictured in Figure 7 satisfies these needs.

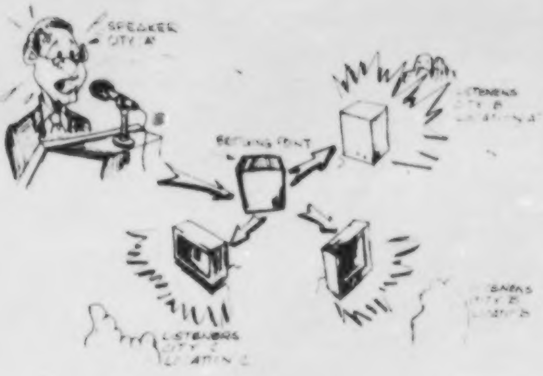

SPEAKER CITY 'A'
BRIDGING POINT
LISTENERS
LISTENERS

FIGURE 7. BROADCAST TELECONFERENCE

Methods of Establishing Audio Teleconferences

The various audio teleconferences pictured thus far may be established in any one of four ways. The conference rooms and/or stations may be hard wired as suggested by Figures 1 through 7 or they may have been established by a telephone operator of the Message Telephone System (MTS). Two other possibilities also exist. These are referred to as Ad-Lib and Meet Me arrangements.

Toll Conference Operator. Figure 8 depicts the conference originator at Telephone A being connected to conferees at B and C by means of operator controlled cord circuits associated with a suitable bridge located in the telephone company's central office. This system has been around a long time and in fact, is still the only system available on the MTS. Note, some of the newer private branch exchanges (PBX) are equipped so that other local stations may be added to an incoming call. Although these arrangements are often referred to as "conferencing" they are, in reality, only "add-on" features.

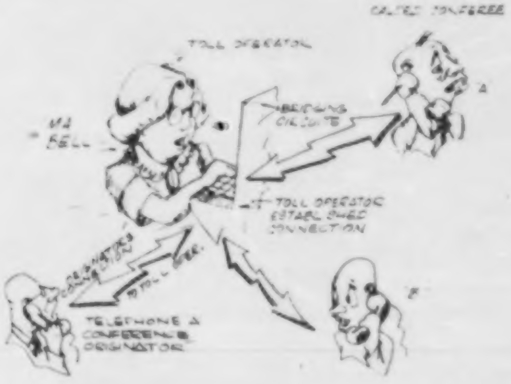

CALLED CONFEREE
TOLL OPERATOR
MA BELL
BRIDGING CIRCUITS
A
TOLL OPERATOR ESTABLISHED CONNECTION
ORIGINATOR'S CONNECTION
TO TOLL OPER.
B
TELEPHONE A CONFERENCE ORIGINATOR

FIGURE 8. TOLL OPERATOR CONTROLLED TELECONFERENCE

Meet-Me. Normally when one wishes to call a meeting he first identifies a time and place generally acceptable to all or most proposed attendees. He than sends out a meeting notice which usually contains some sort of agenda and information regarding time and location of the meeting. Attendees hopefully show up at the designated place and hour. One could envision an audio teleconferencing system that would be managed in the same way. Instead of being advised of a meeting place the conferees would be given a telephone number to call at the proper hour. His call would be automatically answered and placed in the conference bridge along with all other conferees. This then is Meet-Me teleconferencing and may be pictured as in Figure 9.

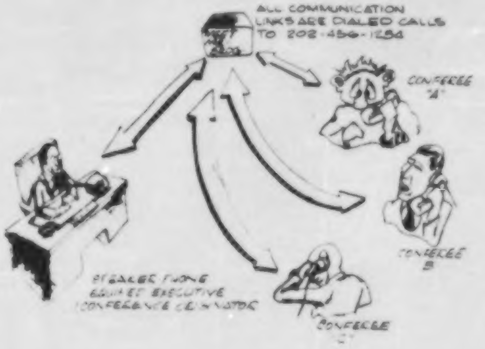

ALL COMMUNICATION LINKS ARE DIALED CALLS TO 202-456-1234
CONFEREE "A"
CONFEREE B
CONFEREE "C"
SPEAKER PHONE EQUIPPED EXECUTIVE CONFERENCE ORIGINATOR

FIGURE 9. "MEET-ME" TELECONFERENCE

Ad-Lib. Since many users of telephone conferencing services prefer the flexibility of managing their own teleconferences, arrangement must be provided that allows the conference originator the capability of dialed access and remote control of each audio teleconference. The remote control feature should give the originator the capability of dropping and redialing any conferee, selecting any conferee line for private discussion outside of the bridge, and blinding the received signal from any or all conferees. The blinding capability is useful to prevent conferee background noise from entering the bridge when the audio teleconference system is in the "Broadcast" mode. Audio teleconference systems equipped for remote control by the originator are referred to as Ad-Lib systems, see Figure 10.

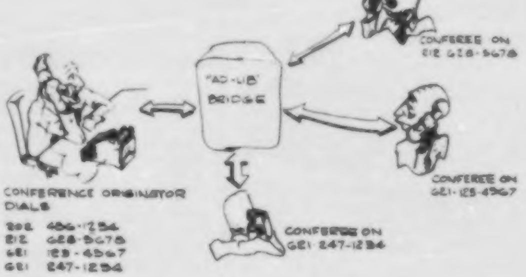

"AD-LIB" BRIDGE
CONFEREE ON 812 628-5678
CONFEREE ON 621-123-4567
CONFEREE ON 621-247-1234
CONFERENCE ORIGINATOR DIALS
202 456-1234
812 628-5678
621 123-4567
621 247-1234

FIGURE 10. "AD-LIB" TELECONFERENCE

Interfaces

Thus far in this section of the paper we have been briefly reviewing audio teleconference arrangements, modes of operation and methods of establishing or assembling conferees by various interconnections of communications links. Detailed discussions of hardware arrangements have been purposely avoided since this paper is intended to concentrate on transmission systems and considerations. However, this section of the paper would not be complete without mentioning briefly how the audio sensing devices and reproducers; the microphones, loudspeakers and telephone handsets, are connected to the communications links. The "interface" or connection between the audio device and the communications link will depend somewhat on the type of transmission system employed in the communications link and the audio instruments used at each terminal.

POTS. If the audio teleconference is established utilizing the plain old telephone (POTS) and the Message Telephone System (MTS) the interface is nothing more than the telephone set which is directly connected to the local loop and subsequently to the network through the local exchange. Since the MTS is basically a two-wire transmission system the interface device, the telephone set, will include a hybrid. The hybrid and its associated balancing network is employed to separate the transmit and receive signals as they enter and leave the local channel. See Figure 11. The hybrid is mentioned here since, as will be discussed later, its characteristics have considerable impact on the overall performance of the audio teleconferencing system. The MTS will be discussed in more detail subsequently.

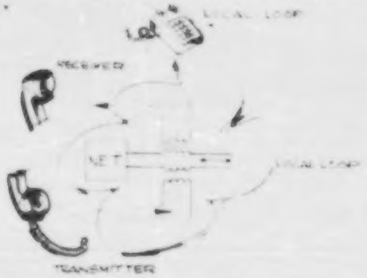


FIGURE 11 POTS INTERFACE THE HYBRID

It should come as no surprise that the POTS telephone set, slightly modified, could be arranged to interface with a private or dedicated communications channel which may be either a two-wire or four-wire transmission system. Two and four wire systems will be discussed subsequently. The telephone set hybrid would not be required in the fourwire system.

Speakerphone. The sensing and transducer elements of the telephone set may be replaced by the speakerphone which gives the teleconference originator or conferees "hands free" operation as was pictured in Figures 2 and 9. Of significance from a transmission standpoint is the fact that acoustic feedback now becomes a major concern. Review Figures 5 and 6. Although speakerphones can be modified to interface four-wire communications channels they are usually used on the two-wire MTS. In the speakerphone system the simple hybrid is replaced by a rather complex voice actuated switch which mutes the loud speaker when speech energy is present at the microphone. A typical speakerphone installation is pictured in Figure 12.

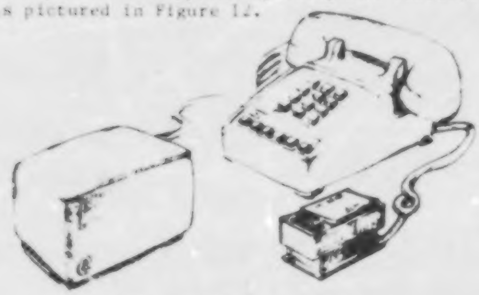


FIGURE 12 SPEAKERPHONE

The Bell Type 50A conference telephone is similar to the speakerphone but it is intended for portable use and may be readily connected to any local telephone loop. The 50A has two microphones, only one of which can be actuated at a time. As is the case of the speakerphone, room acoustics play an important part. In each case talkers should be within about a foot and a half of the microphone for best results.

Systems Requiring Sound Reinforcement. Because the speakerphone and 50A conference telephone are more or less restricted to use in small rooms, other arrangments must be made for large conference rooms and/or auditoriums when they are to be interfaced to communications channels. Since room acoustics play a significant role in the overall performance of such audio teleconferencing systems such rooms must generally be specially treated acoustically. This is a comprehensive subject in itself. Bell Telephone Laboratories has recently completed work covering the treatment of rooms to be used for audio teleconferencing. Although the work is yet unpublished the Bell System operating companies have been furnished suitable guidelines for their use.

Interfacing large conference rooms with communications channels requires a unit not unlike the heart of the speakerphone except that provisions are made for inputing several microphones and additional amplification is provided for delivering audio power to several loudspeakers usually located in the room's ceiling.

Microphone placement is especially critical. Bell Telephone Laboratory studies show that the allowable distance between talker and microphone bears a direct relationship to the room acoustics and generally must be within a few feet of the talker. Microphones suspended from room ceilings have been used in existing systems and probably will continue to be used wherever less than satisfactory audio teleconferencing can be tolerated. In cases where large auditoriums are to be interfaced with audio teleconferencing systems the existing audio sound reinforcing system must be interfaced to the communications link by means of a device similar to the ones described above. However, it must be pointed out that room acoustics that may seem satisfactory to occupants of the auditorium will very often be completely unsatisfactory to the listener on the far end of an audio teleconference network. Such systems have been made to work however but, obviously, it is not the intent to cover such systems here.

TRANSMISSION SYSTEMS

Types of systems; facilities; and bridging methods.

Types of Systems

What do we mean when we refer to a transmission system used in audio teleconferencing? A transmission system, as will be discussed in this section, is a collection of communications links interconnected by some form of bridging device so that two way exchange of information may take place between each end point of each communications link. Furthermore, each communications link is composed of one or more communications facility. In other words, the communications link extends between conferee interface and the bridge where as the facility is the physical media, wire or multiplex carrier, of which the link is composed. Transmission Systems may be divided into two major categories, identified here as either (1) dedicated networks or (2) the Message Telephone System (MTS).

Dedicated Networks. In keeping with the above definition of a transmission system Figure 13 shows several communication channels each extending from a bridge to a telephone set, speakerphone or treated conference room or auditorium. An additional communication channel is used to interconnect two bridges each of which may be located at points convenient to the telephone sets served. Each of the communication channels are composed of one or more facilities. The facility may be either two or four wire. Types of facilities will be addressed in later paragraphs. The actual electrical design of dedicated networks are complex and beyond the scope of this paper. However, some of the parameters affecting such designs i.e., loss, noise, circuit balance etc. will be addressed in the next section of the paper. It will be shown later that the number of stations that can be conferenced and the number of bridges employed depends on the distance between stations, which affects noise build up and the degree of electrical balance, echo control, that can be achieved in the design. Keep in mind that there will be some form of hybrid at each station. Each of these and the bridges, because they are not electrically perfect devices, will contribute some echo or feedback. In addition each facility may contribute some feedback. In fact there will be hybrids at the intersections of all four-wire and two-wire facilities. Obviously, all of the noise and echo contributed by each communications link will be added at the bridge and will be evident to each listener. Further discussions may be found in references.

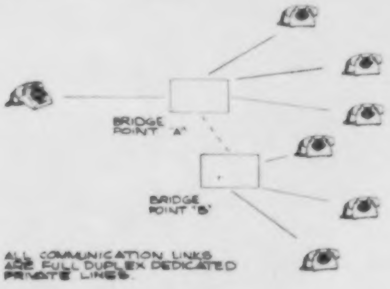

BRIDGE POINT "A"
BRIDGE POINT "B"
ALL COMMUNICATION LINKS ARE FULL DUPLEX DEDICATED PRIVATE LINES.

FIGURE 13. DEDICATED TRANSMISSION SYSTEM

Message Telephone System (MTS). When maximum flexibility is required as was pictured in Figure 4, the Message Telephone System (MTS) should be considered. As shown in Figure 14, the MTS is composed of a complex network of switches arranged in tandem. Each station of the network is connected to its End or serving office by means of a two-wire local channel or facility. End offices, designated as Class 5, are connected to their serving Toll or Class 4 offices. Although the links between the Class 5 and 4 offices, the Toll Connect Trunks, may be made up of fourwire facilities, Class 5 and 4 offices are usually two-wire switches.

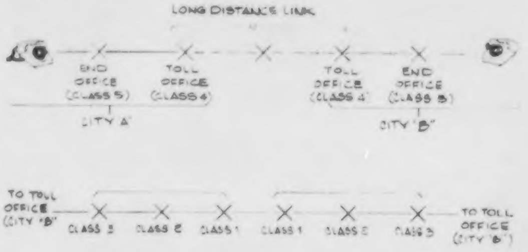


FIGURE 14. MESSAGE TELEPHONE SYSTEM

As pictured in the lower portion of Figure 14 Toll offices are interconnected by a network of trunks and higher ordered switches. These switches are designated as Class 3, 2 and 1 and are all four-wire switches interconnected by four-wire trunks. Not every Toll connection will be made up of links between all classes of offices. In some cases Toll offices may be connected directly to other Toll offices, or links passing through only one or two other intermediate switches. A detailed description of the MTS may be found in reference 1. The electrical characteristics of the MTS as related to audio teleconferencing will be addressed later.

Types of Facilities

Each communication link of an audio teleconferencing system, whether it be a dedicated network or one utilizing the MTS, will consist of one or more facility. These facilities may be either two or four wire cable or may be channels of a multiplex carrier system. Carrier systems are usually four-wire, that is the transmit and received directions are separated paths.

Two-Wire. Since the two-wire facility is composed of a single transmission path, bi-directional energy must be separated at each end of the facility by means of some form of hybrid so that the energy in each direction may be either amplified or, in the case of received energy, be used to actuate some form of transducer. See Figures 11 and 15. Energy on the transmit side of the hybrid is divided between the facility and the balancing network. In an ideal situation,

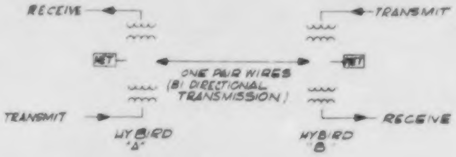


FIGURE 15. TWO - WIRE FACILITY

the energy divides equally and completely so that no energy is reflected towards the received side. Since, however, the network will only approximate the characteristics of the two-wire facility, the electrically perfect hybrid balance will never be achieved and some energy will always appear on the receive side. In dedicated systems precision balanced networks may be used to achieve a high degree of balance limiting reflected energy or echoes. However, in switched networks, such as in the MTS where facilities having different characteristics must be switched together, only a compromise balance can be achieved. These facts are of major importance to audio teleconferencing systems as will be shown in the next section of this paper.

Four-Wire. Four-wire facilities consist of two pairs of wire or two separated channels in the case of multiplex carrier systems. See Figure 16. Obviously, since there are no hybrid devices required to separate the two directions of transmission and since hybrid balance and echo are not factors the four-wire facility is ideally suited for audio teleconference systems.

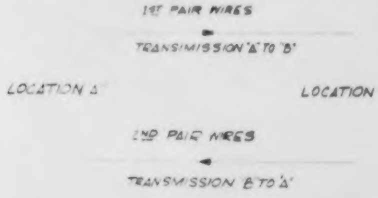


FIGURE 16. FOUR-WIRE FACILITY

Bridging Methods

Our purpose here is only to relate networks and facilities to audio teleconferencing systems pointing out items of significance to be considered in the design of such systems. Transmission requirements that have been established for two point telephone services generally apply to audio teleconferencing systems. These requirements are described in various engineering documents and accordingly need not be repeated.

Interconnecting three or more conference locations requires use of bridging hardware to interconnect the transmission path to each of the locations. Ideally, the conference bridge should cancel echos generated internally to the bridge, protect conferees from external noise and echo and have minimal transmission loss. Two methods of bridging will normally be encountered in audio teleconferencing systems. These are referred to here as Mid-Point and as End-Point bridging.

End-Point Bridging. Figure 17 is intended to portray the situation where the bridging element of the audio teleconferencing system is located at one end of the network. In this arrangement one station, usually the originating station, is connected to several remote stations via independent communication links. Assuming the approximate distance between the originator and each conferee (Points A thru D of the figure) is about equal, it is evident that the electrical or transmission loss is about twice as much between each conferee as it is between conferee and originator. This is referred to as loss contrast and can be a serious problem in audio teleconferencing systems. Ideally, this loss contrast should be minimized by placing the bridging element midway between each conferee and originator. There are other reasons, however, as will be discussed, for Mid-Point bridging.

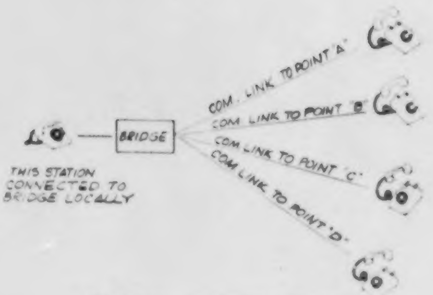


FIGURE 17. END POINT BRIDGING

Mid-Point Bridging. Mid-Point bridging, as shown in Figure 18, is relatively easy to accomplish in the design of a dedicated audio teleconferencing system. Such dedicated systems can be designed so that the electrical loss is nearly equal between all points on the network. This is even true if more than one bridge is used if the link between bridges is designed to have zero loss or unity gain. See Figure 19. Audio teleconferencing systems utilizing the MTS, of necessity, must utilize End-Point bridging since the center of the MTS is not readily accessible. However, considerable work has been done developing an audio teleconferencing system which utilizes Mid-Point bridging on the MTS. This system utilizes bridges placed within the switched network at the Class 3, 2 or 1 switching points. Review Figure 14. The desirability of Mid-Point bridging, especially in switched network environments, will become evident in the next section.

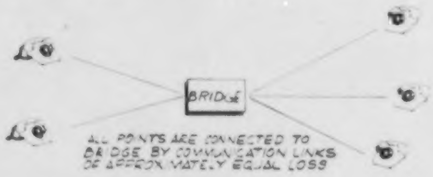

BRIDGE
ALL POINTS ARE CONNECTED TO BRIDGE BY COMMUNICATION LINKS OF APPROXIMATELY EQUAL LOSS

FIGURE 18. MID POINT BRIDGING

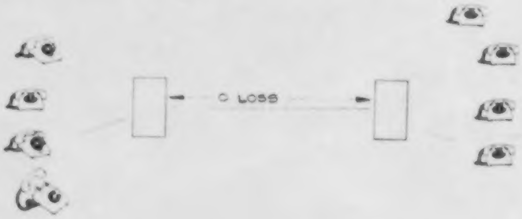


FIGURE 19. MID POINT BRIDGING TWO BRIDGES

TRANSMISSION CONSIDERATIONS

A discussion of some parameters effecting transmission; impact of the parameters on Audio Teleconferencing Systems; noise and echo treatment; and bridging elements.

Some Parameters Affecting Transmission

Of the many electrical parameters affecting transmission on any two-point voice band communication system, see reference, the three that are of prime consideration to designers of audio teleconferencing systems are loss, noise and echo. These three are to be addressed here.

Loss. Connections established over the switched network will typically have an end to end loss of about 14 dB. Direct connections (private line or dedicated networks) are designed to have an end to end loss of 10 dB or 16 dB respectfully for two-wire and four-wire services. Since, as stated above, transmission requirements for two point switched and non-switched or dedicated services apply to audio teleconferencing systems the following discussion will be developed by considering a typical two point connection established over the MTS. The Bell Laboratories 1969 - 1970 connection survey[2] showed that the 1,000 Hz loss between End offices could vary by several dB but the mean measurement of all test connections was 6.7 ± 6 dB with a standard deviation of 2.1. Loop surveys have shown that, as pictured in Figure 20, the end to end loss for two point connections will generally approach 14 dB. As indicated, trunks between switches are engineered in accordance with Via Net Loss (VNL) design. Simply stated, VNL design takes into account the link and types of facilities and their delay characteristics so that the overall loss of typical built up connections will be sufficient to compensate for echo delay. Typically, trunk losses between switches will be less than 1 dB. Note that at least 5 dB of loss between End offices is assured by the 2.5 dB fixed loss designed into each Toll connect trunk.

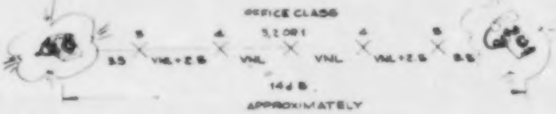


FIGURE 20. LOSS (TWO POINT CONNECTION)

Since all communications links are subject to echo due to impedance imperfections and since a talker's tolerance to echo can be controlled to some extent by introducing loss into the echo path it follows that some end to end loss must be built into all connections. As it turns out, approximately 14 dB seems to be a reasonable figure around which to build our discussion of noise and echo.

Noise. Noise as it relates to communications links is discussed in a Bell System technical reference[3] and is repeated here in part.

Noise on telecommunications channels arises from numerous sources. Some of these are thermal noise from amplifiers, 60 Hz and its harmonics which may be picked up from power line induction, intelligible or unintelligible cross talk, single frequency tones, and switching and signaling transients. All of these effects and others come under the general heading of noise.

Background noise has been referred to in various places as white noise, Gaussian noise, message circuit noise, etc. What is intended is a frequency weighted measure of the total power on a channel not arising from the desired signal. The frequency weighting used is called "C-Message" weighting. See Figures 21 and 22.

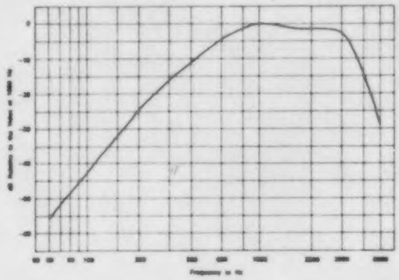


FIGURE 21. C - MESSAGE WEIGHTING CHARACTERISTIC

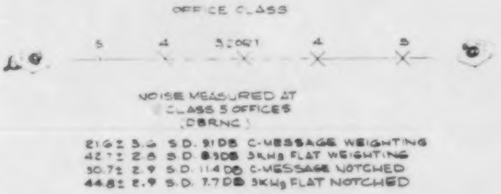

OFFICE CLASS
5
4
3,2 OR 1
4
5
NOISE MEASURED AT
CLASS 5 OFFICES
(DBRNC)
21.6 ± 3.6 S.D. 9.1DB C-MESSAGE WEIGHTING
42.7 ± 2.8 S.D. 8.3DB 3KHz FLAT WEIGHTING
30.7 ± 2.9 S.D. 11.4DB C-MESSAGE NOTCHED
44.8 ± 2.9 S.D. 7.7DB 3KHz FLAT NOTCHED

FIGURE 22. NOISE TWO POINT CONNECTION

Echo. As stated in the Bell System technical reference[4] on transmission parameters, impedance mismatches in a circuit give rise to reflections of signal energy called echoes. A single reflection causes energy to return to the transmitter (talker echo). If the single reflection is again reflected at an impedance mismatch, signal energy will arrive at the receiver sometime after the original signal (listener echo). Echoes due to multiple reflections also occur, but they are usually insignificant by comparison with those due to single or double reflections.

As stated earlier echoes generally cause no problems on four-wire channels. However, on two-wire channels, and on channels containing both two-wire and four-wire facilities, echoes may be interfering to voice combinations. Echoes are controlled by matching impedances and by controlling loss in echo paths.

As was shown in Figure 15 hybrid transformers are used to join two and four-wire facilities. The impedance of the balancing network ideally is the same as the impedance looking into the two-wire facility. If this condition is met, signal power from the received side of the four-wire facility will divide equally between the balancing network and the two-wire facility and no signal power will "return" on the transmit side of the four-wire facility. In practice, the match is never perfect. Morever, the match is different at different frequencies. Some portion of the received signal power is thus returned on the transmit side of the four-wire facility.

Various tests are used to determine channel quality with respect to echoes. These include return loss, echo return loss, singing return loss, singing point and singing margin.

Return loss is the ratio in dB of the power of a single frequency signal placed on the received side of the four-wire facility (Figure 15) to the resulting power at the frequency appearing on the transmit side.

Echo return loss is a weighted average of the power returned to all frequencies between 500 and 2,500 Hz and then expressed in dB.

Singing return loss is also a weighted average of the reflected power at all frequencies in a frequency band expressed in dB. There is a low frequency test covering the 200 to 500 Hz band, and a high frequency test covering 2,500 to 3,200 Hz band.

Methods for performing these various tests are discussed in the Bell System technical reference.

Impact of Transmission Parameters on Audio Teleconferencing Systems

Thus far we have reviewed loss, noise and echo as related to typical two point connections on the MTS. Had we directed our attention to dedicated networks we would have seen that measurements of these parameters would have revealed similar figures. Generally, these parameters are more easily controlled on dedicated communications links. Accordingly, dedicated systems may be engineered to have specific end to end losses, and noise and echo requirements held to closer tolerances. Since audio teleconferencing systems are made up of several two point connections bridged at an appropriate point or points we will now turn our attention to the overall effects of loss, noise and echo when combined at the bridging point. This will be done by a further examination of echoes followed by more on noise, loss and control.

Combined Echoes. Since we are primarily concerned with talker echo let us turn our attention to speech signal levels (measured in VUs) as they may appear on a typical two point connection. See Figure 23. Although a typical talker's speech level will vary widely at the interface of his telephone instrument and the local channel, a figure of -13VU could be assumed Assuming in addition, an end to end loss of 14 dB, the speech energy would reach the listener at approximately -27VU. The distribution of speech energy along the circuit might typically be as shown on the figure.

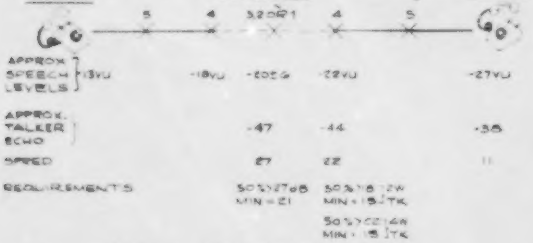


FIGURE 23 ECHO TWO POINT CONNECTION

Now let us consider the resulting talker echo, that is, the amount of reflected energy at various points along the circuit. If all design objectives have been met we could expect to measure reflected energy as shown on the figure.

Specifically, as shown, 50% of all such measurements should exhibit reflected energy levels greater than 27 dB below the signal energy at the mid-point of the circuit. In other words, since the signal energy at the mid-point measures minus 20 VU, the reflected energy at that same point must measure greater than 47 VU on at least 50% of all connections. The minimum acceptable level would be 41 VU or reflected energy 21 dB below the signal.

It is important to note that the spread between signal levels and the level of reflected energy varies at different points along a typical circuit. If all design requirements are met this spread varies from 27 dB at the circuit mid-point to 11 dB at the interface between the telephone instrument and its local channel. The reason for this may become clearer when one realizes that the reflected energy is reduced by the amount of loss in the circuit as the reflections are (propagated) back towards the talker. In addition, keep in mind the fact that, since the center links are all four-wire, most of the reflected energy is developed in the two-wire portions of the circuit and will be reduced by the amount of loss in the four-wire sections.

Let us now assume that we are going to place a bridging device at some point in the two point connection. The bridge is intended to distribute the talkers energy, ideally without loss, to each of several other connections. See Figure 24. Likewise, reflected energy from each of the other connections will be combined at the bridge and returned to the talker as shown on the figure. The amount of energy returned to the talker will be the power summation of all reflected energy received at the bridge. Thus if one considers each bridge port to be a hybrid reflecting energy the amount of reflected energy becomes greater as more and more legs are added. The spread between the signal energy and the reflected energy before the addition of legs may be thought of as the initial hybrid balance which is reduced by 3 dB every time the number of legs added to the bridge is doubled.

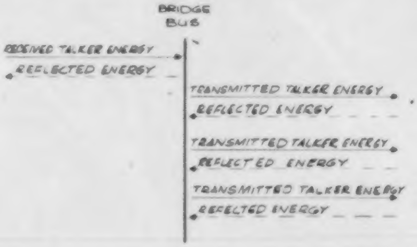


FIGURE 24. DISTRIBUTION OF TALKER ENERGY AT BRIDGING POINT

Specifically, let's assume a bridge is placed at the interface point between the telephone instrument and its local channel. (End-Point bridging). The reflected energy at this point is approximately 9 dB below the signal therefore our assumed hybrid balance is 9 dB. Now as we proceed to add legs to the bridge this balance will be reduced by 3 dB everytime the number of legs is doubled. In other words, adding the first leg reduces the balance to 6 dB, adding two more legs reduces it to three dB and adding four more legs further reduces the balance to 0 or the point at which the circuit becomes instable. See Figure 25.

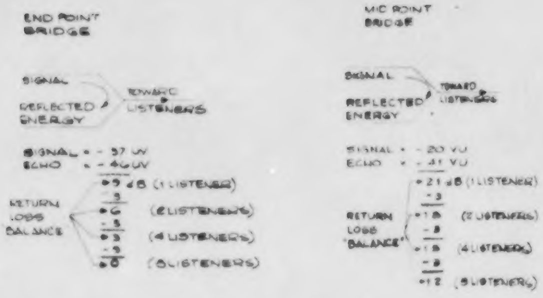


FIGURE 25. DISTRIBUTION OF ECHO AT BRIDGING POINT

Now consider what happens if the bridge is moved to the center of an audio teleconference connection. (Mid-Point bridging). Since the reflected energy at this point is 21 dB below the signal, an assumed hybrid balance is 21 dB. Adding the first leg reduces the balance by 3 dB to 18 dB. Adding two more legs reduces it to 15 dB and finally the addition of four more legs reduces the balance to only 12 dB. The significant point to grasp here is that the bridge, when located at the center of the network, still has a 12 dB margin for circuit stability after adding 8 legs to the bridge as opposed to 0 dB after adding 8 legs to an end-point bridge. See Figure 25.

In the above discussion it was assumed that the bridge element did not contribute any reflected energy. In other words it was assumed that the bridge was a perfect device and the separation between talker energy and reflected energy was infinite. Such is not the case. At best, a perfectly terminated resistive bridge will reflect talker energy at levels only some 40 dB lower. More will be said about this later.

Combining Noise. Noise appearing on each leg is added to the bridge element as in any circuit exposed to several noise sources. Obviously, the bridge should be placed in a circuit or network at the point where each leg contributes the least amount of noise. Referring again to Figure 22 one would assume that mid-point bridging is preferred.

Noise and Echo Treatment

Reviewing the above discussion it is evident that within an audio teleconferencing system some provisions are needed for controlling echo and noise. Quantitatively speaking the point at which such treatment becomes necessary depends upon the number of conferees to be interconnected and the location of the bridge within the network. Designers of audio teleconferencing systems are then faced with two questions, when and how. When is treatment for noise and/or echo necessary and how is the treatment to be accomplished? This section deals with these questions but will not go into detailed hardware specifications.

Treatment For Noise. In considering noise treatment two situations should be addressed. Situation 1 consists of a single communications link between two conference rooms equipped for audio teleconferencing. Situation 2 consists of individual communications links between several audio teleconference rooms or stations. In the first case special treatment will generally not be required because the noise contributed by the single link should be within tolerable limits. In the second case, however, each communications link is a noise contributor and although each link could be within tolerance the combined noise of several links could result in an unacceptable noise level to each listener. Since, in a well disciplined conference situation, only one bridge port should be active (talker energy present at bridge) at any instant, the obvious solution to control noise is to terminate all inactive ports. The port terminations could then be lifted automatically by the incoming speech energy whenever a port becomes active.

Switched gain amplifiers are devices that contain special circuits for detecting the presence of speech energy. Whenever speech energy is present pads of some predetermined loss are switched out restoring the activated port to full sensitivity. Therefore, a switched gain amplifier containing 15 dB pads would reduce noise levels at the input to a bridge port by 15 dB whenever the port is idle. In other words 25 dBrnc of noise at the input to a switched gain device would appear at the bridge at a level of 10 dBrnc.

Treatment for Echo. From the above discussion one can see that pads in each port leg would protect against echo build up as well as noise. It should also be noted that a pad in the transmit leg, which would normally be switched "out", could be switched "in" whenever energy is present on the received side of that port. This action would reduce the level of echoes returned to the talker that may arise within the bridging element.

Treatment Using Switched Gain. A typical voice switched gain unit consists of two variable gain amplifiers, one in the transmit path (input to the bridge) and the other in the receive path, and a differential control circuit. When used with a two-wire connecting unit the gain of each amplifier can be varied electronically from 0 to 15 dB, depending upon the speech levels received at the bridge port. The amplifier in the transmit path normally has no gain, so that the constant 15 dB attenuates weak input signals (such as noise) before they enter the bridge. The energy of a conventional voice causes an increase in gain of the amplifier effectively canceling out the 15 dB constant loss; and the speaker's voice enters the bridge without attenuation. This feature prevents the noise present on each bridge connection from building up to unacceptable levels when many connections are made to the bridge.

Switching of gain should not be detectable to the conferee listeners. The three most important parameters involved in the switching action are the amount of switch gain, time constants and threshold slope.

As previously mentioned, the loss required for adequate echo control and bridge stability is 15 dB. The time constants involved in switching gain are attack time and hangover time. These two values were selected. by a compromise. The attack time has to be short enough not to clip the first syllable of speech and long enough not to be sensitive to impulse noise. A range of 1 to 5 milliseconds has been judged best. The hangover time must be long enough to prevent false operation or echoes and to prevent noticeable gain changes between syllables; if it is too long, however, a rapid interchange between talker's will be hampered (i.e. the amplifiers will not switch fast enough). The hangover time best meeting these requirements has been found to be between 100 and 150 milliseconds. As a result, the design requirements are 3 plus or minus 2 milliseconds for attack time and 150 plus or minus 75 milliseconds for hangover time.

A "soft-switch" is required in order to prevent sudden drops in level during a weak talker's speech since some syllables will be too weak to keep the switch on. Soft switching renews the loss gradually as the talker's voice goes through the threshold, thus considerably reducing the sudden change in level affect. The threshold level (point where a talker's speech volume completely switches out the loss) is, therefore, a slow instead of a single cutoff value. Figure 26 shows the attack and hangover time constant for various talkers' level and Figure 27 illustrates the relative switching aspects of soft vs. hard switching.

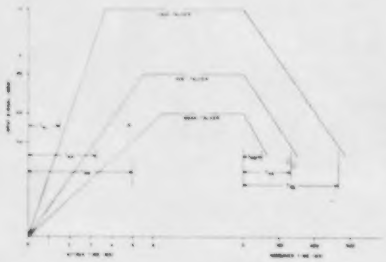


FIGURE 26. ATTACK AND HANGOVER TIMES OF SWITCHED - GAIN AMPLIFIERS

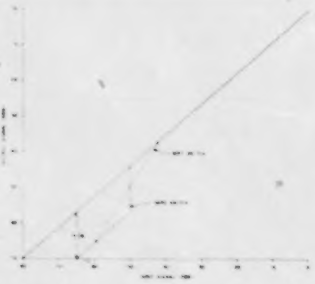


FIGURE 27. SWITCHED - GAIN PARAMETERS

Other design considerations for switched gain amplifiers include the dynamic range of talkers and the maximum power requirements. These two factors determine the threshold level. It has been found that the loudest speech rarely exceeds +7 dBm and the weakest speech seldoms drops below -40 dBm; therefore, the threshold sensitivity which will completely switch the loss from the transmit to the receive side is set at -40 dBm. A switching guard circuit prevents a small amount of speech energy, returning as an echo, from operating the amplifier in the transmit path and a noise operated gain adjusting device prevents noise as high as 55 dBrnc from operating the switch.

Typical Switched Gain Amplifier. A typical switched gain amplifying device is shown (schematically in Figure 28). The switched gain amplifier unit consists basically of a receive amplifier, a transmit amplifier and electronically controlled pads which controls the gain through the receive and transmit legs of each bridge port.

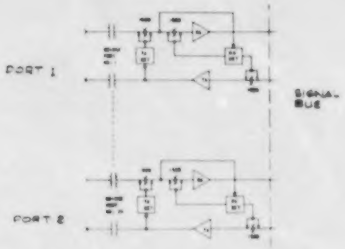


FIGURE 28. TYPICAL SWITCHED - GAIN AMPLIFIERS

The receive leg has two pads, an Echo Pad and Signal Pad. Each pad introduces a 15 dB loss. The Signal Pad is "IN" in the idle condition and switches "OUT" when an incoming voice signal is present at the receive amplifier input. The Echo Pad is "OUT" in the idle condition and is switched "IN" whenever a signal is present at the transmit amplifier output.

The transmit leg has one pad which has a loss of 15 dB (24 dB option). This pad is "OUT" in the idle condition and is switched "IN" whenever an incoming signal is present at the receive amplifier input.

The Signal Pad in the receive and transmit leg are controlled by circuitry consisting of an amplifier, a limiter, a voice filter, and a peak detector. The DC signal controlling the pad is monitored by a light-emitting diode (LED) Lamp on the front panel of each switched-gained amplifier module. This lamp, the RA Lamp is "ON" when a voice signal at a receive amplifier exceeds a certain minimal level (adjustable by the receive amplifier sensitivity potentiometer).

The Echo Pad controlled circuitry consist of an amplifier and peak detector. The DC signal control of the Echo Pad is monitored by a LED Lamp, the TA Lamp, on the module panel.

Thus, a voice signal at 0 dBm level, incoming to the input to Port 1 reaches the output of the same port attenuated over 60 dB (return loss factor). The same signal also reaches all other ports at 0 dBm or some predetermined level. In other words, there is a large loss from the input of the port to its output, but there is no loss or some predetermined small loss or gain to all other outputs.

Bridging Elements

The bridging network has one primary function. It must connect all conferees together so that transmission between any two ports have low loss and the echo returning to the talker is very low. (The application of bridges in certain system designs may include gain devices to offset losses inherent in the system external to the bridge.)

In this discussion bridges are classified as either passive or active. Passive bridges, more commonly referred to as resistive bridges, have been used almost exclusively in earlier multipoint private networks and audio teleconferencing systems. Active bridges, bridges containing active elements, have come into use more recently concurrent with the developement of transistors and integrated amplifier devices. Little will be said about resistive bridges. Two types of active bridges will be discussed.

Resistive Bridges. Resistive bridges may be described as resistive hybrids in each port. Individual balance adjustments (impedance matching on each port) and the use of metallic film resisters for each port allow the stability and echo return loss requirements to be met but not easily when compared with the advantages of active bridges. A perfectly balanced resistive bridge will restrict the return loss (RL) to about 40 dB at best. As will be seen, this figure can be improved substantially using an active bridging element.

Active Bridges. Active bridges have been employed in audio teleconferencing systems in recent years more or less experimentally. With the exception of the Time Division (TD) bridge (to be described) active bridges are not generally available "off of the shelf" but can be fabricated utilizing solid state integrated circuits such as operational amplifiers.

TD Bridge. The TD conference bridge package currently available provides 24 port bridging capability and is designed to serve large conferencing requirements. The TD conference bridge compares favorably with a perfectly balanced four-wire resisted bridge and has the added advantage that it cannot be unbalanced by shorted, opened, or missmatched ports. Theoretically, TD bridges should have an infinite return loss, due to stray capacity and coupling between wires, however,some finite return loss is to be expected.

The bridge is designed for central office installation and utilizes a 10 and 1/2 inch by 23 inch equipment cage. The bridge is designed for use with a negative 24 volt filtered DC supply.

The bridge is composed of several plug in modules. A complete bridge package includes 24 switched gain amplifiers of the type described above, 13 filter switching units, a scanner unit, and a maintenance field test panel. Each of 12 filtered switching units accommodate two ports. The 13th filtered switching unit is used as part of the maintenance panel. Two or more TD conference bridges may be used intandem or a bridge can be split in various ways to function as two or more bridges of less capability.

Each bridge port includes a switched gain amplifier and a filter switching unit. Filter switching units are controlled by pulses from a scanner unit and are interconnected by a common bus wire as pictured schematically in Figure 29. The switched gain amplifier unit consist bascially of a receive amplifier, a transmit amplifier and electronically controlled pads which control the gain through the receive and transmit legs of each port. The operation of these amplifers are as described above.

Each filter switching unit contains two identical circuits, each serving one bridge port. Voice signals enter the input low pass filter and are "keyed" by an electronic switch to the central or bridging bus wire. Signals on the bus are then fed through a second electronic switch and low pass filter in the transmit legs of each port. The electronic switches are driven by control pulses from the scanner in such a way that each receive leg is conducting only one 24th of each scanning cycle. Transmit legs are conductive twenty three 24th's of each scanning cycle. Thus, each receive leg is turned "ON" (connected to the bridge bus) for only about 3 microseconds during each scanning cycle. During this "ON" period, the corresponding transmit leg of the port is turned "OFF" (disconnected from the bridge port). In other words, the voice signal reaches the bridge bus wire but is blocked and cannot enter its own transmit leg. This prevents feedback and results in high return loss. The signal, however, can reach all other transmit legs of the bridge.

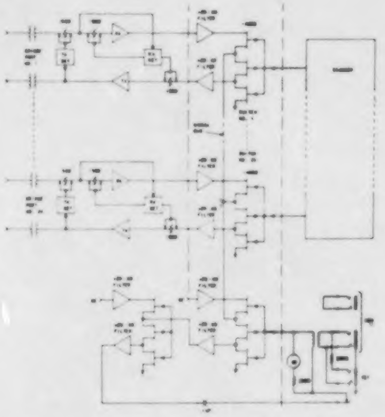


FIGURE 29. TRANSMISSION PATH TIME DIVISION BRIDGE

The scanner unit consist of a 300K Hz multivibrator, a binary counter, two "1 of 16" decoders, and a bi-stable flip-flop circuit. The first "1 of 16" intergraded decoders decodes clock pulses from 1 to 12; then the flip-flop switches the clock pulses to the second decoder which counts from 13 to 24. The 24 outputs of the scanner are sequential pulses at the rate of 12.5K Hz. Each output keys an appropriate switching unit. The scanner is powered by a 5 volt DC Zenner regulated source derived from the 24 volt central office supply.

The maintenance panel consists of jacks for each port and a VU meter for use in lining up the switched gain amplifiers. The VU meter is connected to the bridge bus by means of a filter switching circuit. It should be noted, however, that this filter switching unit is not keyed but is turned "ON" at all times.

Active Bridge Utilizes Selective Summing. A second type of active bridge receiving increase attention currently may be described as one consisting of operational amplifiers tied together using selective summing techniques. A bridge of this type is pictured in Figure 30.

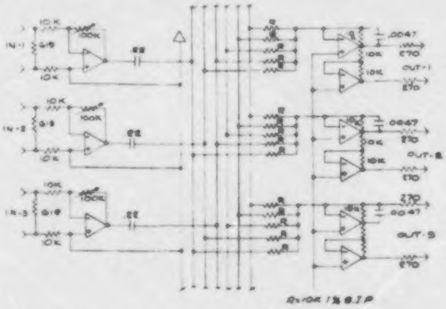


FIGURE 30. ACTIVE BRIDGE UTILIZING SELECTING SUMMING

Discussions of selective summing techniques may be found in currently available literature.[5] The major advantage of these bridges are that they have extremely high return loss factors. In addition such bridges can be easily cascaded and are cost effective.

Selective summing is achieved by the "R" resisters as shown in the figure. The addition of another operational amplifier to develop phase inversion is shown in Figure 31. The addition of phase inverson to the selective summing bus improves the return loss factor still more. Figures of 80 dB or more are achievable.

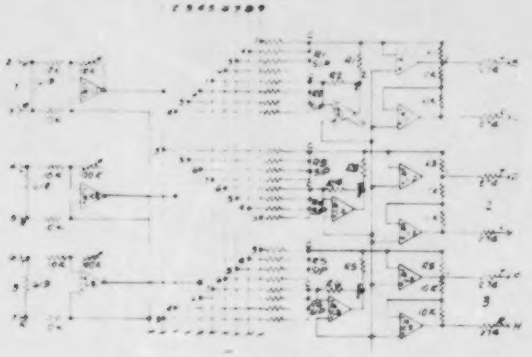


FIGURE 31. ACTIVE BRIDGE UTILIZING SELECTIVE SUMMING & PHASE INVERSION

CONCLUSIONS

Some recommendations and
a glimpse at the future.

Recommendations

During the past several years increasingly large numbers of audio teleconferencing systems have been coming into existence. Many of these systems have been provided to meet the needs of specific customers and have employed dedicated networks. Most of these systems have been developed without the benefit of suitable industry standards. Much impressive work has been completed by designers of hardware both within and external to the Bell System. Most of the techniques system designers employed stem from work at Bell Laboratories dating back to the earliest days of private line and toll conference services. Still more recent work within the Bell companies and at Bell Telephone Laboratories on audio teleconferencing systems utilizing switched private networks and the MTS suggests several recommendations that are presented here for consideration. These recommendations include bridge placements, terminal units and conference rooms to be equipped for audio teleconferencing.

End-Point vs. Mid-Point Bridging. Discussions regarding noise and echo in the preceding section of this paper substantiates our recommendation that whenever audio teleconferencing systems employ switched networks, either private or MTS, bridges should be placed in the electrical center of the network. Such placement reduces Loss contrast between stations and improves circuit stability, i.e. singing margin. Refer to Figures 18, 19, 23, 24, and 25.

It is realized that certain customer requirements can only be met economically by employing end point bridging. These situations usually occur in dedicated private networks. In such situations the use of active bridging employing selective summing and phase inversion techniques is recommended.

Regarding Use of Speaker Phones. The use of speaker phones or similar devices on audio teleconferencing systems should be limited especially on systems interconnecting large numbers of conferees. The reasoning for this is as follows: Audio teleconferencing systems interconnecting large numbers of conferees most likely will employ switched gain amplifiers on each bridge port. The combined effects **of voice switching at the speaker phone and at the bridge port often results in severe speech clipping. Experience has shown however, that these undesirable effects are reduced substantially when the Bell Type 4 Speaker Phone is employed at each station. In addition, whenever speaker phones are employed for voice teleconferencing systems users should keep in mind the fact that speaking within a reasonable distance of the speaker phone unit is essential.**

Regarding Rooms Requiring Sound Reinforcemnt. **Detailed recommendations regarding the interconnection of conference rooms requiring sound reinforcement (very large rooms or auditoriums) are beyond the scope of this presentation, however, a few general comments are appropriate. As mentioned earlier in the paper, Bell Telephone Laboratories has recently completed extensive work regarding the acoustic treatment of such rooms and have produced a set of guidelines dealing with microphone and speaker placement as well as acoustic treatment. Since this paper is yet unpublished it is not available for general distribution.**

Our recommendations are as follows: Rooms other than auditoriums should be interfaced with communications links by utilizing specially designed hardware packages containing voice switching devices and sound reinforcing amplifiers equipped to handle up to four microphones and speakers. Although the speakers may be mounted in the room ceilings, microphones generally must be placed within 1 1/2 to 3 feet of the talker. The rooms, in most cases, will require acoustic treatment.

Large auditoriums will generally require specially engineered interfaces between the communications link and the sound reinforcing equipment normally employed within the auditorium. Two way full duplex conferencing in such cases is extremely difficult. Since proper microphone placement is of prime importance it appears that each situation must be treated independently on a "per case" basis.

A Glimpse at the Future

To be complete any discussion on audio teleconferencing must contain some thoughts regarding the future. The views expressed in the final paragraphs of this paper are the authors and do not necessarily reflect the views of his company's associates or company's policies regarding audio teleconferencing. The author's views are presented here to stimulate more thoughts and discussions concerning future audio teleconferencing. The author's views are presented here to stimulate more thoughts and discussions concerning future audio teleconferencing needs with the hope that such actions will eventually lead to the market research and technical development work necessary to turn proposals and plans into realities.

Direct Dial Conferencing (DDC). A trial is currently underway to evaluate a new Bell System service that will provide for the direct dial and control of an audio teleconference from any Touch Tone equipped telephone station. This service will give a conference originator the capability of directly dialing up to any six conferees reachable on the MTS. (The trial restricts bridge access to originators within the Minneapolis, St. Paul calling area.) This new service provides automatic billing. In addition it allows the originator to drop and redial any conferee or to remove a selected conferee from the bridge for private discussion. Although the system is currently limited to conferences of up to seven inviduals it is conceivable that future systems will be developed to handle larger conferences on a dialed up basis.

Meet-Me Systems of the Future. The DDC trial discussed in the preceding paragraph is the Ad-Lib type pictured in Figure 10. Future conference systems utilizing private switch networks or the MTS will most likely also provide Meet-Me capabilities such as was pictured in Figure 9. Educational seminars and "Monday morning" staff meetings could be handled very efficiently on a Meet-Me basis. Such systems have a further advantage in that each conferee would be automatically billed separately as though he had place a conventional toll call. The originator would only be billed for the originating connection to the bridge and possible for bridge usage.

Possible unauthorized entry into the Meet-Me bridge has been viewed with considerable concern. Future Meet-Me systems would be equipped with the necessary logic to give the originator the capability of "unlocking" only those ports required.

Graphics. Users of audio teleconferencing systems are looking to the communications industry to provide the capability of simultaneous voice and graphic transmission over a "dialed-up" connection. This capability could be provided by either establishing a second dialed-up connection between graphics machines or by using some form of interdispersed voice and data transmission over a common teleconferencing system.

Manufacturers of graphics terminals should give consideration to the "impact" of "mid-point" bridging on their system design. Future graphics hardware should include polling capability to achieve syncronization between the transmitter at the originator point and receivers at remote points. Another approach would be to provide syncronization techniques that do not require "hand-shake" routines.

Conferee Interrupt. In those situations where the audio teleconferencing originator chooses to use the "broadcast mode", see Figure 7, the teleconference system should include a response system that would give the conferee listener the capability of "raising his hand" to signal his desire to speak. This action should be carried out so as not to disturb all other listeners. Recalling that, in the "broadcast mode", all conferee transmit paths to the bridge are normally blocked, one could imagine a system wherein the conferees transmission path to the bridge could be used as a signal path to be connected to logic at the bridge capable of storing "conferee signals" and retransmitting these over the originator's receive path to a suitable device provided at the originators lectern. Thus, the use of this "student to teacher" link would not interfere with the lecture since the signal paths would by pass the bridging element.

Computer Teleconferencing. Computer Teleconferencing is not new. It has been around for some time now in the form of computer time share systems. Such systems, when properly programmed could be used for computer to computer conferencing. However, one need not stretch his imagination too far to envision an audio teleconferencing system fully controlled by mini-processors that would establish preprogrammed conferences at appropriate times automatically dialing all intended conferees. Such a system might even recall an absent conferee at a later time to "replay" the conference.

The Ultimate Audio Teleconferencing System. Finally in conclusion and by way of review, let us look at the capabilities of ultimate audio teleconferencing system. Such system would:

1. Be available to any telephone station on the MTS network
2. Utilize the MTS network for maximum flexibility
3. Utilize mid-point bridging to maximize transmission performance
4. Utilize latest solid state active bridging elements to optimise transmission.
5. Provide for complete originator control
6. Handle small (up to 6 conferees) or large (up to some practical limit) conferences
7. Provide Meet-Me as well as Ad-Lib capabilities.
8. Provide for a broadcast mode.
9. Provide for conferee signalling during a "broadcast". Appropriate "Add On" terminal equipment would be available to the originator on short notice for "one short" needs
10. Provide equipment to interface to appropriately equipped conference rooms and auditoriums. Such equipment would also be made available as portable units for one shot requirements
11. Utilize latest solid state active bridging elements to optimize transmission
12. Allow originator capability of selecting bridging location to minimize his cost. Selecting bridges would improve network efficiency by reducing trunking needs
13. Provide for the transmission of graphics simultaneously with speech.

Since complete communications and understanding between individuals involves more than just the spoken word the ultimate would be a visual as well as an audio teleconferencing system.

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INSTRUCTIONAL DESIGN

Charles A. Wedemeyer
Lighty Professor of Education Emeritus
The University of Wisconsin-Madison/Extension

Recently a talented colleague, director of a sophisticated computerized information system, expressed his frustrations in attempting to create a data information base on the instructional activities of his institution. In talking with many instructors he could find no common elements discernable--in goals, activities, evaluation--on which to build a useful information system.

The situation my friend contends with is, of course, the reason that some institutions are giving increased attention to what has been called "instructional design." Of course my computer information friend could find no design evident in the instructional activities of his institution because none had ever been built into it.

What I shall try to do in this brief paper is to provide an overview of instructional design, elaborate one example, and identify and discuss some of the problems relating to instructional design. In later sessions of this conference there will be opportunities to go into specific aspects of instructional design in depth.

What is "instructional design"? The term has been in use since the early sixties, and those who use it seem to understand what it means; but six years ago, the monumental Encyclopedia of Education[1] did not even index the term; nor, in 1976, did the more compact Handbook on Contemporary Education.[2] However, in both these comprehensive and usually definitive references, there are articles on the systems concept in education, and systematic instructional development.

Let me suggest that that which is instructional is broadly intended to inform, instruct, guide, advise, develop, counsel, assist, manage, encourage, motivate, structure and access respecting the range of education and activities carried on by teachers for the benefit of learners. The term design identifies purposeful conceptions or plans, planning to achieve a predetermined end, to devise or prepare a specific function, provide a framework for what comes after, to conceptualize a project or scheme in which the means to an end are specified.

Instructional Design, ergo, seems to mean the purposeful planning of instructional functions and activities as means for achieving predetermined learnings outcomes for an instructional system. This definition is, of course, unsatisfactory in several respects; but perhaps it will suffice for the moment.

The definition implies that education (teaching and learning) is a rational process, with purposes, roles, functions and activities for teachers and learners, that the process can be learned, applied and evaluated, and that it is linked to general and specific theory and practice in teaching and learning.

Instructional design, first as a concept and then a process, came into being in response to the changed situations in which teachers and learners now carry out their different roles. Some of the reasons for the rise of instructional design are:

- changed societal contexts in which schools function
- expanded missions for many educational institutions, and especially post secondary
- evidence that conventional schooling is not very successful in producing learners capable of functioning adequately in our society, and carrying on continued learning
- the rise of nontraditional learning systems
- new client groups for education, and the increased mobility of all learners
- consumerism in education, and new demands for accountability
- the growth of scientism and specialization among educators
- the upgrading of training to sophisticated levels
- the application of cost-benefit assessment techniques to education
- the use of media and technology in education
- the growing use of prepared materials and systems in teaching and learning
- coping with the factor of physical distance between teacher and learner in nontraditional education, and with the increased antonomy of learners
- the persistence of differing philosophies and psychologies respecting learning--all the way from the cognitive-developmental, to the romantic and the behaviorist.

The pressures developed by these different factors affecting education underlie the need for instructional design. Superficially it may appear that instructional design is something new. In fact, it is merely the more sophisticated successor, in new social and educational contexts, of the "lesson plans" which neophyte or in-service teachers were taught and expected to be able to use in an earlier day.

The principles on which instructional design is based would seem to include the following:

1. Instruction must be designed to fit the societal contexts within which education occurs.
2. There must be a consistent and appropriate philosophy and psychology of learning applied in the instructional endeavor.
3. Instruction must fit the age, developmental,

socio-economic, cultural and linguistic needs and characteristics of target learners, and be directly sensitive and responsive to such individual learner characteristics as previous educational attainments, self concept and field dependence-independence in learning.

4. Instruction must assist learners to reach appropriate and relevant objectives, whether knowledge is an end itself or knowledge is a means to other ends.

5. Instruction must interest learners intrinsically in achieving their objectives, or minimally a combination of extrinsic-intrinsic motivations.

6. Instruction must employ as many channels as possible in order to achieve the greatest possible individual learner achievement.

7. Instruction must recruit and exploit the shields and resources of the institution and the community as a whole to assist the learner in self development.

8. Instruction must include evaluative feedback to meet the needs of the learner as well as the instructor respecting achievement and learner self development.

9. Prepared instructional units must be tested or piloted with adequate samples of the intended target learners, and revised or modified as needed.

The techniques on which instructional design is based were set forth, in part at least, by the Association for Educational Communication and Technology in 1972. A systems approach to instruction (which I have taken to be another way of expressing the concept of instructional design) was defined as generally including these activities:

1. A needs assessment
2. The selection of a solution to the problems indicated by needs
3. The development of objectives for instruction
4. An analysis of tasks and content implied in the objectives
5. The selection of strategies for instruction
6. The determination of the sequence of instruction
7. The selection of media
8. The location or development of resources
9. Piloting the resources and materials
10. Revising the resources and materials
11. Recycling from continuous feedback.[3]

Suppose we now turn to a hypothetical situation that seems to require the application of instructional design. Let us assume that we have the responsibility for developing the faculty at our institution to serve an enlarged mission for the institution: we are not only going to serve students in conventional classroom instruction, but we are going to reach out beyond the classroom to learners in the larger community, in line with institutional enthusiasm (and mission expression) for including a larger clientele in continuing learning, partly because of zero-growth or declining enrolments in conventional programs.

Preliminary discussion with policy-making boards and administrators have made it clear that the institution is prepared to support, as an essential in achieving the broader mission of the university, the use of media/technology in the program of outreach beyond the campus. The faculty, however, is uncertain about the effect of the new program on traditional faculty roles, and quite unprepared to assess realistically the new requirements that seem to be implied for teaching staff. Media people, who see the situation as an opportunity for expansion are moving aggressively to secure for themselves central positions of power and control over the new programs. Extension, long denied the full support of the university in outreach and required to carry out inferior roles in curriculum development and control over rewards for their successful learners, are furious because the expansion opportunities they have long sought now seem to be going to Johnnies-come-lately in communications. The School of Education, which might be expected to provide some leadership in the difficult period of transition, has been so tied to the support of conventional schooling and related research that it in fact has no faculty either competent to work in the new area or willing to abandon school-related careers. As the implications of the new program become better known, faculty reactions become polarized, all the way from the converted enthusiasts who honestly see themselves as emerging Kenneth Clarks, Alistair Cookes, and Jacob Bronowskis, to the hostile and derisive who honestly see the program as the death knell to all they hold dear in academia.

(This script, with minor variations, is for most of us reminiscent of "where we came in.") What should be done?

The President, sensitive to the polarized faculty and the jockeying for leadership by conflicting interests, decides that the wisest course is to bring in an outside "expert" to advise the institution on the process that should be undertaken. It's the safest course, at the moment, because the outside expert on a short term consultancy can be ignored if need be: his recommendations can be thrown to various standard or ad hoc committees to be devoured until the internal power plays are resolved.

The outside expert sees the situation as an Arthurian "Castle Perilous" with needs respecting both teaching and learning. Hence he devises an instructional design that will not only move the institution towards its new mission, but also will be a model for the development of the programs to follow. Let us now look at his recommended instructional design, which, since the program outcomes are unknown at this time and can't be given names, he calls "Phases in the Process of Applying Media and Technology to Instruction."

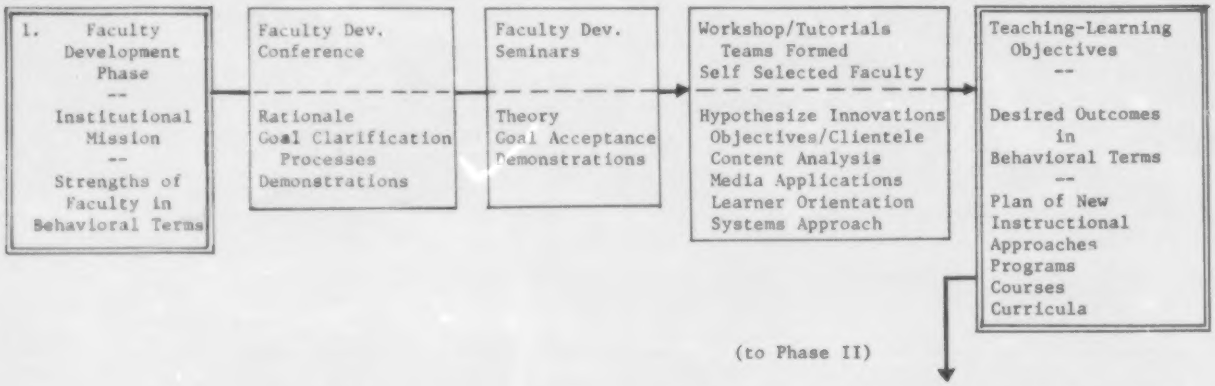
He presents his proposals to the President and Trustees, and various faculty groups (any which will listen) by using a few slides which he explains as he goes along. He is employing what he regards as a humanized systems approach to instructional design, but he does not call it that. This is his report:

There are three phases in this approach to applying media and technology to instruction.[4] The first phase (see Figure 1) is the Faculty Development Phase. It begins with an examination or determination of institutional mission and an assessment of faculty strengths in behaviorial terms.

FIGURE 1

PHASE I IN APPLYING MEDIA AND TECHNOLOGY TO INSTRUCTION

Preliminary: defined objectives of process and staffing strategies


1. Faculty Development Phase
--
Institutional Mission
--
Strengths of Faculty in Behavioral Terms
Faculty Dev. Conference
Rationale
Goal Clarification Processes
Demonstrations
Faculty Dev. Seminars
Theory
Goal Acceptance
Demonstrations
Workshop/Tutorials
Teams Formed
Self Selected Faculty
Hypothesize Innovations
Objectives/Clientele
Content Analysis
Media Applications
Learner Orientation
Systems Approach
Teaching-Learning Objectives
--
Desired Outcomes in Behavioral Terms
--
Plan of New Instructional Approaches
Programs
Courses
Curricula
(to Phase II)

Phase I

The key to successful employment of the process is Phase I, yet this aspect of the systems approach is most frequently left out. It is here that the human and the humane concerns of the institution find early expression. It is here that the humanists, social scientists, scientists and professional specialists of the institution--the content teachers, administrators, counselors and librarians--provide the mix necessary to make substantive and process decisions respecting instruction. The institution's media and technology personnel may or may not lead the process; that point is decided in the staffing strategies worked out earlier. Whether such personnel lead or not, however, they form the nucleus of the working group throughout the process.

It is important to note that the process does not begin with a discussion of media and technology *per se*--a topic that quickly descends to a nuts and bolts level of insignificance. The intent in Phase I is just the opposite: to involve a total faculty in high level inquiry, i.e., mission, philosophy, development of rationale for instruction and selection of instructional goals. Such activities require time, patience, careful preparation and commitment. As Silberman has pointed out, the school must be a "center of inquiry" in which all teachers are always learners, and in which learners are never objects.

The process begins with a faculty development conference at which prepared position papers on the institutional mission, and an analysis of faculty strengths available for accomplishing the mission, are considered and debated. A rationale for applying media and technology--as a means of improving achievement of the mission--is presented and debated. Out of this discussion, goals for instruction emerge and are clarified. The processes for reaching goals are agreed upon. The conference also may include short demonstrations of media and technology at appropriate points, but always as specific means for accomplishing some instructional objective. It is generally not productive at this point to divert participants from major concentration on ends and goals. *What* the institution should accomplish in its instructional program is more important at this stage than *how* it should instruct.

From the general faculty conference, the process now moves to faculty development seminars. In the general conference, new faculty leadership may have emerged. Staffing strategies previously agreed upon enable these leaders to be employed in the seminars. It is important that strong faculty be prominent and responsible leaders in the seminars that follow. Those seminars offer an opportunity for small faculty groups to probe instructional theory and to move from goal clarification to goal acceptance, a very subtle and significant process itself. Again, demonstrations that are germane to the process and the debates should be included.

As the seminars come to an end, goals for instruction will have been accepted, along with a body of theory about instruction. A series of workshops and tutorials is then made available to faculty members who have elected to go the rest of the way in applying media and technology to instruction. In the workshops, faculty begin to hypothesize the innovations that they wish to make, to erect specific teaching objectives for particular clientele, to make content analyses, and to consider specific media and technology for application in a learner-oriented instructional program constructed through a systems approach, a term they now feel more comfortable with.

At the end of Phase I, the institution can be expected to have achieved accepted teaching and learning objectives, desired instructional and learning outcomes in behavioral terms, and a definite plan of new instructional approaches. But there is often a remarkable bonus at this point: the waves set up by the process have reached far beyond instruction *per se* to affect concepts of courses and curricula. Indeed, because Phase I is deliberately focused on large ends, with media and technology considered only as amenable means, the inquiry is generally far-ranging. Only when the academic house is put in order respecting mission, goals, objectives and outcomes for clearly perceived social and learner needs do media and technology have a mandate or imperative. Phase I, then, is the process not only of initiating renewal in the institution; it is also the process of legitimizing the means to be employed.

The process suggested here is flexible. It can be used with an entire faculty as an institutional project, or it can be used in a school, division, or department. An individual could go through the process by himself, if he was the only one concerned. But if action requires the involvement of others, then they must also participate in the process. The process can be entered wherever the participants are ready to enter. If they are at the workshop level, they enter there. If participants discover that they are not in fact ready, the process can be reversed to reach back to the elements needed. Of course, the process works more smoothly when an accurate assessment of readiness has been made; this achievement is one of the likely outcomes of the beginning faculty conference.

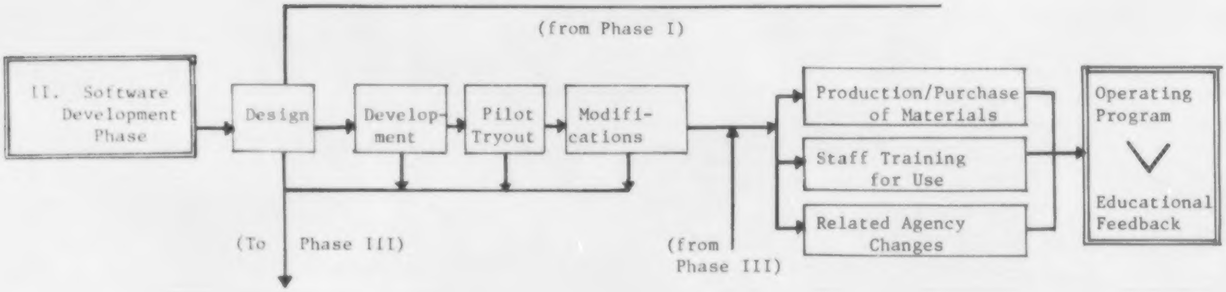
Phase II

If Phase I has been successful in defining mission, goals, objectives and outcomes in a plan for applying media and technology to instruction, then Phase II, Software Development (see Figure 2) begins immediately. As an outcome of Phase I, self-selected and group-accepted faculty have emerged to take positions of leadership. Working with media, technology and educational specialists of various kinds, faculty continue the workshops and tutorials in which hypothesized innovations first occurred. The workshop tutorials are now, however, tightly focused on the specific projects that emerged in the instructional plan at the end of Phase I.

Software (the activities, materials and processes for teaching, learning and evaluation to be communicated by the hardware) is planned, and development is launched before hardware considerations are begun. The initial part of Phase II is design: the creation of the total scheme for a specific course, course sequence, curriculum or unit. The design includes all the elements that must be incorporated into the finished product to be communicated. Much consideration is given to the selection of media and the application of technology, before hardware is procured. From objectives and desired outcomes in behavioral terms come clues which signal needs for audio and visual and other kinds of mediated instruction. From analyses of activities and content come other clues that identify the kinds of learning sought. From a study of learner profiles and their actual physical environments for learning come still other clues that focus instruction on learner needs, characteristics and orientation. The design features would be incomplete, however, without a realistic appraisal of the institution's total resources for instruction. Such appraisal would include the strengths of its faculty and of its ancillary services. Finally, the design must include specific provisions for evaluation and feedback, for both are essential (but often ignored) parts of the instructional system. In short, the design must incorporate and adapt all the means at the disposal of the institution for achieving the ends that were conceived in Phase I. Each element of the design, as well as the design as a whole, is tested by continual referral to the conclusions and agreements reached at the end of Phase I. If the design takes a different direction, implying a change of objectives or outcomes, all involved must agree to the changes, to conserve the integrity and credibility of the project.

FIGURE 2

PHASE II IN APPLYING MEDIA AND TECHNOLOGY TO INSTRUCTION



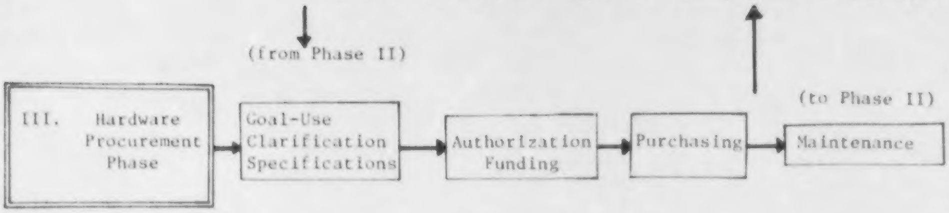
When the design has been completed, it is a good idea to convert it to a document which includes both a narrative of what is proposed and a systems-based flow chart detailing each step of the projected development. Who is to do what, dates for beginning and completing units of work, points of coordination, review and decision making (including approvals) and all the inputs from the resources to be employed.

Development may then begin; i.e., the persons or groups assigned responsibility go off to do their work. The project director orchestrates the activities from the design document. As the materials, activities and processes emerge, considerations of media and technology become central. Decisions are made to use this medium or that, to employ this technology or that. From these decisions, the specifications for hardware are evolved. As soon as they are firm, Phase III (Hardware Procurement) may be launced to run concurrently with Phase II.

With completion of each segment of materials, activities and processes, there should be a pilot tryout of the software, making use, if possible, of rented,

FIGURE 3

PHASE III IN APPLYING MEDIA AND TECHNOLOGY TO INSTRUCTION



manufacturer-loaned hardware or simulated means. The learners in the pilot tryout should be small samplings of the target learners. Modifications in the software should be made as required on evidence from the pilot tryout.

Phase III

The hardware (the equipment and processes used to communicate the software) procurement phase was begun with the completion of the design and the start of software development in Phase II. That Phase yielded the specifications necessary for selecting and procuring gear appropriate to the instructional goals. It is important to realize that hardware considerations should be subservient to those of software, which is designed to achieve agreed upon goals. Selecting hardware first is usually a prelude to the disaster whereby means take precedence over ends.

There are some apparent exceptions to the principles cited. After a faculty member has been through the phases suggested in this paper, so that he approaches a high level of competence in the process, he can compress the process and work back and forth among the three levels almost simultaneously; yet he can preserve the order of priority according to the hierarchy of humane values and goals determined in Phase I and implemented in Phase II.

To suggest that hardware follows software (see Figure 3) does not denigrate hardware. The three phases indicate priorities, a practical sequence of activities that will most efficiently achieve a marriage of software to hardware in reaching instructional goals. Hardware introduced at the wrong point often leads to failure. The hardware is not to blame; the process of planning and development is. Yet unused and misused hardware around the country (and the specialists who advocate technology) are the recipients of blame which often should be ledged elsewhere. When hardware is promoted and selected separately from software and the goals of education, means are in danger of becoming ends. Conversely, media and technology are most favorably employed when used as means to humane ends.

The marriage of software to hardware produces yet another bonus. Despite the prominence of McLuhan's views, there is still widespread disbelief or outright antagonism to his concept that "the medium is the message." Yet anyone who has designed, developed and produced a unit of mediated instruction will not ignore or mistake the meaning of that significant observation. When it is understood and applied, media are raised from the hardware level to the software level.

Our total process in applying media and technology to instruction should now be reviewed (see Figure 4). Phases II and III come together as materials are purchased or produced and as the staff are trained to use them, and any related agency changes are made as necessary in operating the new instructional program.

A special word must be said about evaluation and feedback. The process suggested has been presented in linear form to avoid the drawing of conflicting flow lines. However, evaluation (as noted earlier) has been part of the process from the beginning. Evaluation is not an "add-on" at the end, but an integral part of the entire process, and an integral part of the mediated instruction that the process creates. Hence, evaluation continues after the three-phased process ends, and feedback from learner evaluation, as well as from teacher evaluation, flows in reverse along the lines on the chart. If someone is there to receive feedback (as determined in the design), the process starts all over again at whatever point is appropriate.

Well, our outside expert was thanked and sent on his way.

There were, however, a number of different problems that were encountered as the institution began to move through the instructional design. Perhaps these problems are fairly general, encountered in many places, and require special consideration in instructional design, particularly for nontraditional learning systems. Let me put these problems in the form of questions:

1. What are the motivations of those who propose or oppose learning via technology?

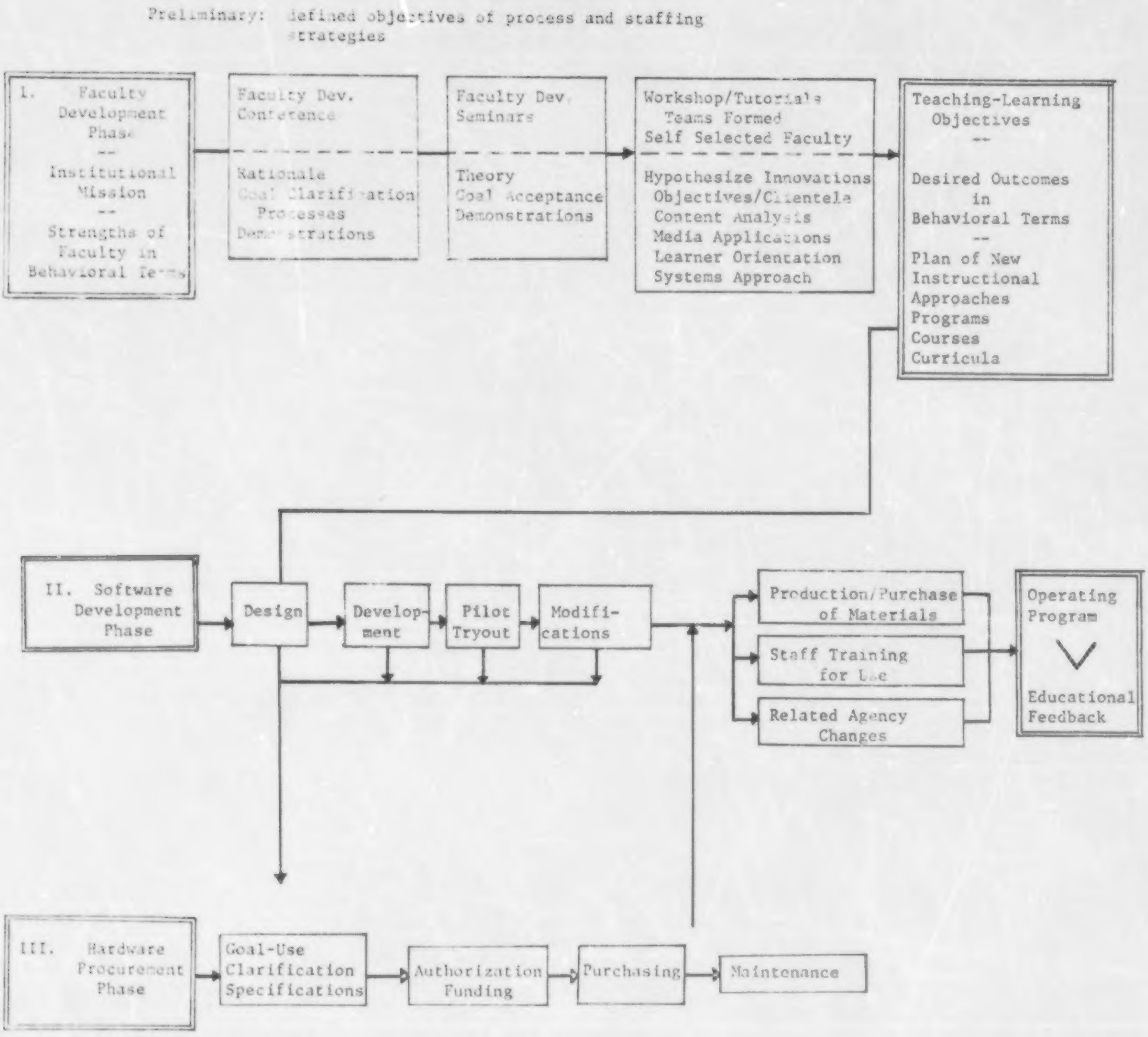
Do we have a conflict of empire builders versus empire retainers? Are distance education, independent learning projects undertaken for the laudable motive of safeguarding the tenure of teachers threatened by slipping enrolments in conventional programs? We should be reminded that results are largely a matter of beginnings. Employing technology in learning for the wrong motives clearly imperils the result because the institution enters the project without paying heed to the institutional changes that must occur if technology is to be employed with success. However, an institutional need or problem (such as a threatened redundancy of teachers) can be used to generate appropriate motivations concerning learning or learners.

2. What is, or are, the mission/missions of the institutions which propose to employ technology in learning?

Whatever the initial motivation may have been, the first step in developing a proper motivation is an examination--and if necessary a modification--of the mission/s of the institution. Universities which have emphasized the traditional knowledge-as-end mission are encountering pressure to accept the additional, co-equal mission of knowledge-as-means to other social/

FIGURE 4

PHASES IN THE PROCESS OF APPLYING MEDIA AND TECHNOLOGY TO INSTRUCTION


Preliminary: defined objectives of process and staffing strategies
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Strengths of Faculty in Behavioral Terms
Faculty Dev. Conference
Rationale
Goal Clarification Processes
Demonstrations
Faculty Dev. Seminars
Theory
Goal Acceptance
Demonstrations
Workshop/Tutorials
Teams Formed
Self Selected Faculty
Hypothesize Innovations
Objectives/Clientele
Content Analysis
Media Applications
Learner Orientation
Systems Approach
Teaching-Learning Objectives
--
Desired Outcomes in Behavioral Terms
--
Plan of New Instructional Approaches
Programs
Courses
Curricula
II. Software Development Phase
Design
Development
Pilot Tryout
Modifications
Production/Purchase of Materials
Staff Training for Use
Related Agency Changes
Operating Program
Educational Feedback
III. Hardware Procurement Phase
Goal-Use Clarification Specifications
Authorization Funding
Purchasing
Maintenance

individual ends. This is a profound shift. If traditional institutions cannot, or will not make this shift, then new types of institutions arise. Hence there will very likely be three types of institutions, according to mission, in the future:

A. Institutions with knowledge-as-end missions. This is important, and must be strengthened rather than weakened because the need for new knowledge is increasing.

B. Institutions with dual missions: knowledge-as-end and knowledge-as-means. This duality of mission will characterize institutions such as the land grant universities, where the Extension idea is already vigorous. Combining missions is the most difficult arrangements of all because of the tension inherent between the two missions and the faculties which serve each.

C. Institutions with knowledge-as-means missions, such as the Open University of the United Kingdom, the University of Mid America, etc. These will proliferate.

It may be pointed out that the three types of mission institutions already exist, but in the future the differences will be more sharply defined, better recognized, and not the basis of an artificial hierarchical classification in society.[5]

Selecting a knowledge-as-means mission implies great change in other system characteristics: students served; operations; faculty-academic selection, rewards, governance; curriculum, instruction, learning and rewards; diffusion, access and communications; and institutional funding and support.

3. If technology is used to reach distant learners, where is the environment for learning and what is its importance?

We must give careful consideration to the environment for learning when the classroom is no longer the place where learning must take place. Instead of thinking of the school or classroom as the environment for learning, we must now see that the learner and his surround are the environment. That is what must be enriched. The teacher's tasks include the enrichment of that learner's environment external to the school. This concept will have important implications for the design of physical facilities for teacher and learners. For example, it has already been proposed that no new federal housing should be approved unless it includes a learning center in each home. This question will also have an effect on libraries, museums, art galleries and exhibitions of all kinds, opening up the community of living and working as part of the learner's environment.[6]

Eccles, in his monumental book on understanding the brain,[7] clearly points out the misunderstanding and error that shrouds the popular belief "that environment is dominant in the creation of intelligence. . ." "It can be stated quite categorically," says Eccles, "that brains are built by the complex processes resulting from genetic endowment and all the secondary instructions deriving therefrom in fetal life. . ." "The environment," he concludes, "is important simply for discovering and using what we have inherited."

From the ways in which the brain works in each unique human being, with his mysterious concept of self, there appears to be no risk, and definite advantages, in shifting our concept of the learning environment to the learner and his surround, and enriching that. Technology is not alien to the development of the brain at its three interactive levels inasmuch as the brain, as Eccles points out, is itself the most complex of bio-physical creations, operating on electro-chemical processes so sophisticated as to make even the most advanced man-made computer and sensing technologies appear unbelievably primitive. It was McLuhan, you may recall, who perceived the remarkable natural consequences of "inter-connecting" man's nervous system with the outside world via technology.

4. Can we design instruction on a better understanding of what learning is?

We need to expand our understanding of what learning is. Learning is accomplished in three stages--

A. Acquisition of Information
↓ (from whatever communications mode)
B. Transmutation of Information
↓ (internalizing; link up with previous learnings, experience)
C. Evaluation/Application of Information
(via whatever communications mode)

Learning is idiosyncratic, active, can only be done by learner himself, is different for each learner, and is not complete until the learner has passed learning through all three stages. The learner must do this for himself. In the old classroom model, learning was assumed to fit a space-time frame. A linear, sequential, cause-effect, time-controlled/determined relationship between teaching and learning was accepted. We know now that such a simple view of the teaching and learning relationship is fallacious, but because the classroom model required such a view, and did not provide opportunity for the study of any but captive/submissive learners, there has been little pressure to study learning in any other setting.

Classrooms impose a time constraint on learning which operated to discourage learning through all the three stages. Consequently, teachers tend to assess learning only at the first stage--acquisition of information. We will have to extend our concern for distant, independent learning through all stages of learning, in some ways an easier and more reachable goal in nontraditional systems than it is in a time-sequenced classroom setting.

5. Does mediated instruction require us to expand our ideas of what teaching is?

We need to expand our idea of what teaching is. If teaching is not an event of social interaction as Gagne pointed out, that must be confined to a prescribed social space and communications mode, what is it? Here we may be able to return to the Platonic model, and consider teacher as critic, mentor, guide, adviser, problem-solver, thinker and facilitator. The advance preparation of learning materials, and the response needs of distant learners require such a change. The classroom model emphasized the first stage of learning, with teacher as information and law-giver; it assumed passive learners and depended largely on extrinsic motivation. The new model will not work unless the teacher is seen as the developer of learners, preserving their integrity-responsibility for self direction. It assumes active learners intrinsically motivated, and an equal emphasis on all three stages of learning. (This, too, is a return to the Platonic model.)

6. Do we have to develop different ways of assessing progress in learning?

The classroom model assumed a submission, other-directed learner, present and accounted for. Attendance was important if the teacher's role was that of information and law-giver, and if learning was primarily the acquisition of information. Distant and hence more independent learners, however, exercise a degree of autonomy over their learning; and they cannot be checked for attendance. In the classroom, learning was measured out in time sequences--so many days, weeks, months constituted a course. Personnel accounting practices, such as Average Daily Attendance, made sense as a means of calculating school, department, teacher load and subsidy from public funds. Completion of a course signified just that--the learner had attended, done the assignments of the day, week, month, semester, and taken the examinations, largely but not wholly, tests of information retention. Comportment--amiability in the box, conforming behaviors--became important influences affecting assessment.

There is a clear and present need, now, for all of us to perceive that what we call distant or independent or nontraditional learning are not just a variety of means for extending the box or classroom concept to others, but that the distant, open and independent learning programs are conceptually the opposite of the classroom concept, and hence the emphasis must be on the learner and learning, with assessment on achievement of learning objectives rather than on requirements stemming from the long tradition of attendance, time-measured knowledge, and passivity.

7. When will we begin to perceive the relationship between learning style and success in learning, to learner personality and self concept?

Learner field dependence-independence appears to be significant with respect to learning style, success in problem solving, and personality self concept. If learners may now make choices, options should be designed not alone to provide freedom from time-space constraints, but also to offer differing modes of instruction which best suit learning needs at the time of selection. Furthermore, since it is known that learners tend to mature towards independence, learners should not be expected to need or select the same modes of instruction for learning throughout their lives.

8. Do we need to alter our perception of what knowledge is?

In Jacob Bronowski's last chapter of The Ascent of Man, he pointed out that the long childhood of man will come to an end only as we perceive the importance of man as a learner, and free ourselves from older, prescribed notions of what knowledge is, and how it may be used to create a better society.

Important as educational institutions are, whether knowledge-as-end, knowledge-as-means, or an equal balance of these missions, it is well to remember that learnings, understandings, meanings are significant only in the lives of people and the experience of society; in the success or failure which knowledge brings to the quality of human life and the survival of the species. If institutions become remote from these measures, and arrogant or smug in the exercise of the power conferred by knowledge, then they fail in their missions.

Just over 120 years ago in the Northwest territories of the United States, the Suquamish Indian tribe faced near extinction in its confrontation with the westward movement of white society. The chief of the tribe was a patriarch named Seattle. He had the responsibility to preserve, protect, interpret, assess and disseminate the knowledge-store, the word-hoard, the meanings related to the quality of life and the survival of his people.

In his final negotiation with government agents forcing the Suquamish onto a reservation, Seattle said some notable things that lay ignored, as curious cultural irrelevancies, for over 100 years. He said,

> " . . . if we do not sell, the white man may come with guns and take our land. How can you buy or sell the sky, the warmth of the land? The idea is strange to us. If we do not own the freshness of the air and the sparkle of the water, how can you buy them?
>
> . . . If we sell you land, you must remember that it is sacred, and you must teach your children that it is sacred, and that each ghostly reflection in the clear water of the lakes tells of events and memories in the life of my people.
>
> . . . If we sell you our land, you must remember and tell your children, that the rivers are our brothers, and yours, and you must henceforth give the rivers the kindness you would give any brother.
>
> . . . Teach your children what we have taught our children, that the earth is our mother. Whatever befalls the earth, befalls the sons of the earth. If men spit upon the ground, they spit upon themselves.
>
> . . . The earth [said Seattle] does not belong to man; man belongs to the earth . . . all things are connected. . . . Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself."

Chief Seattle's wisdom and insights were not considered "knowledge" by society. His remarks were collected, stored and ignored as unrelated and irrelevant to the needs of the people on this continent.

9. Can we learn how to deal with the unfriendly, hostile behaviors of individuals and institutions towards mediated and nontraditional learning?

The best route to accomplish this is the involvement of faculties and institutions in nontraditional programs, with a clear perception of the difference of mission in most nontraditional programs. The source of much of the faculty-institutional hostility directed towards nontraditional programs seems to stem from misunderstanding of purpose (comprising a threat to traditional programs) and lack of first-hand involvement and experience.

There are other routes, such as helping the hostile or skeptical to perceive the new programs as ways of building greater job security. This is not a good motivation for building long-term support, but it may help in a pinch; and some of those who--for security reasons--accept a role in non-traditional study, may through involvement become supporters.

It is important in designing instruction to stress quality of learning, not only because quality is needed by learners, but also because demonstrated quality is one thing which captures the admiration of most academics. Here, too, however, difference in mission must be understood.

The avoidance of outright competition with established programs can also improve relations with traditional academics.

The creation of new institutions (with a knowledge-as-means mission) not dependent upon traditional institutions for survival, is another way to reduce the conflicts that sometimes occur when nontraditional programs are projected from a traditional program base. The new institution can recruit for faculty and administration qualified academics who are committed to the concept of institutionalizing non-traditional study. The new institution will not eliminate opposition, but it places it at a different level, and permits greater freedom of development for both new and old.

10. Can we build into our instructional design not only a concern for learner achievement of specific content, but also an equal concern for the development of the learner as a competent learner who is capable of lifelong learning largely on his own?

Can we gradually free learners from dependence upon schools and teachers? Thirty-eight state departments of public instruction have now adopted objectives to strengthen lifelong, continuing learning in their students. After schooling, adult learners will--if they continue learning on their own--be continuing users of various kinds of mediated, distant, independent learning systems. We had better think of what we should be doing in instructional design to prepare learners for a lifetime of continued, independent learning.

Instructional Design is a good deal more than an exercise in systems and technology. It has the potential of being a liberating and humanizing educational force in our society. That it is not always recognized as such suggests that we, too, have much to learn, through an instructional design that transcends the narrowness we all abhor.

Footnotes

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ELECTRONIC BLACKBOARD--FOR GRADUATE ENGINEERING EDUCATION

by Jimmy W. Seyler
University of Illinois, Urbana-Champaign

The design and operation of the individual components that are used in the Electronic Blackboard can much better be explained by Mr. Gabe Torok of Bell Labs., so I will confine my remarks to the design and operation of the Engineering Communication's Network operated by the University of Illinois at Urbana-Champaign. In 1967, we began operation of a multi-media program in Continuing Education which used equipment that could transmit graphics over the relatively inexpensive voice grade telephone lines as one of the useful media for education. Our audience was engineers located throughout the State of Illinois, some as far as two hundred (200) miles from our Urbana-Champaign campus. Our course presentations were for engineers wishing to continue their professional development by taking graduate engineering courses or other professional courses offered by the U. of I. The equipment used at that time was not adequate for use in presenting graduate courses simultaneously to the students on our campus and the engineer working in other communities throughout Illinois.

At one point in time, the University of Illinois and the University of Wisconsin shared courses and instructors each using our own telephone networks by joining our two campuses at Urbana and Madison. We determined that physically connecting and using our separate networks was no problem. Our program offerings were sufficiently different and our time demands for our own networks were sufficiently high that the networks were separated.

At about this time I learned of the experimental work being done on the Electronic Blackboard of Bell Labs., Holmdel, New Jersey. Some of the equipment was demonstrated to us in Chicago and we saw additional equipment at Bell Labs. in Holmdel soon after. At that time the University of Illinois and Bell Labs. agreed to use this experimental Electronic Blackboard equipment on our Network and to evaluate it for possible use in presenting graduate engineering courses. The equipment was basically a very good piece of equipment and we recognized that immediately. We, of course, suggested a few minor modifications, most of which the Bell Labs. personnel were already considering and these have been incorporated into the new equipment which will be available in late 1977.

There are many applications for the Electronic Blackboard other than for educational purposes. But I will confine my further comments to our use of the Electronic Blackboards for engineering professional programs and graduate courses. Many of our graduate engineering courses are of the lecture-discussion type and I would emphasize that discussion is a major factor. Therefore, two-way communication for both speaking and writing is essenital. Much of what an engineer wishes to express about a design, natural forces, and physical changes can be expressed in mathematical terms and symbols. These generally must be written, not just spoken, in order to be fully understood by another engineer and this is particularly true when a non-technically trained individual is a part of the conversation.

The Electronic Blackboard is designed to be used as a single unit but may also be combined in groups of two, three, or more. For graduate engineering courses we use a minimum of three (3) Electronic Blackboards and an equal number of T.V. monitors.

We are currently using dedicated voice grade telephone channels; however, we anticipate going to a dial-up system just as soon as the new equipment becomes available to us. The equipment was initially designed for dial-up access.

The configuration of networks to use may be the most difficult problem to resolve because there are many possibilities with each having advantages and disadvantages.

Our use of the Electronic Blackboard to date has been very good as reported by our teaching staff, our Urbana campus students, and our students at remote centers on the network. We are now using experimental equipment far beyond its design life and beginning to encounter equipment failures. We anticipate longer life and a far better product from the production equipment.

A REPORT ON THE

APPALACHIAN EDUCATION SATELLITE PROGRAM (AESP)

Presented by

Nofflet D. Williams
Director, RCC - AESP
University of Kentucky
Lexington, Kentucky 40506

The February 1977 issue of Scientific American points to the dramatic changes in international commercial communications since the launching of the first commercial satellite, the Early Bird. Satellites "have become the most obviously practical of all space benefits, providing high-quality, reliable and cost-effective telephone, television and data transmission services."[1] The challenge faced by the Appalachian Education Satellite Program (AESP) is: How do we meet the information and communication needs of the people of Appalachia with a hybrid telecommunications system utilizing satellites, cable systems and Instructional Television Fixed Service (ITFS) systems? The initial phase of the Appalachian Education Satellite Program was the first step in meeting that challenge.

Background of AESP

The Appalachian Education Satellite Program is a region-wide, community based telecommunications network which provides a program of public services and continuing education to meet the needs of the Appalachian community. Funded by the National Institute of Education, AESP is managed by the Appalachian Regional Commission (ARC) and receives technical support and satellite broadcast time from the National Aeronautics and Space Administration (NASA).

Initiated in late 1973, AESP was one of three NIE-funded experiments designed to answer questions regarding the effectiveness of satellite systems in delivering educational activities to a large, diverse and unrelated audience. A primary objective of AESP was to improve the skills of Appalachian educators, using the ATS-6 satellite.

At the time this satellite was launched in May of 1974, it was the most complex, powerful and versatile spacecraft ever launched by NASA. Over 3,000 pounds, 26 feet tall and featuring a 30-foot diameter parabolic antenna, ATS-6 was revolutionary in the sense that it reversed the role of the satellite and earth station. Unlike previous system designs, the complexity and power was built into the ATS-6 satellite, minimizing the requirements and the cost of its receiving stations.

From its inception, AESP was a cooperative venture involving the ARC, a Resource Coordinating Center (RCC), and Regional Education Service Agencies (RESAs) from eight Appalachian states. The ARC's Division of Education managed the project. ARC's role since 1965 has been one of forging a cooperative regional development effort in Appalachia involving federal, state, and local agencies; therefore, ARC was in a unique position to effectively coordinate a multi-level organizational approach. The RCC, located at the University of Kentucky, provided academic and television expertise for the development, production, broadcast and evaluation of courseware. RESAs, multi-district educational cooperatives, coordinated the 15 local receiving sites and resources.

During its 1974-75 demonstration phase, AESP developed and disseminated four graduate level in-service teacher training courses--two each in career education and reading instruction. The courses were received by 1200 Appalachian educators who were awarded three hours of graduate credit from the University of Kentucky and from 13 cooperating institutions throughout Appalachia.

For this project, ATS-6 served primarily to receive and retransmit signals in the S-band for the color video broadcasts from the Resource Coordinating Center in Lexington, Kentucky, to the 15 classroom sites located in the Appalachian Region. Because of its multi-channel audio capacity, ATS-6 was also able to receive and retransmit to the classroom sites a series of four-channel audio review lessons developed to augment the videotapes. ATS-3, which was available more often than ATS-6, was used for voice and data mode communications during both the interactive seminars for questions transfer and at regularly scheduled periods for intraproject communications.

In addition to the videotaped program (one-way video via ATS-6), 4-channel audio reviews of the taped programs (via ATS-6), and live seminar broadcasts (one-way video and two-way audio), a comprehensive package of instructional materials was developed for each course and each receiving site was equipped with reference materials.

Evaluation

In evaluating the courses and the overall success of the project, several summative evaluation procedures were carried out to answer a number of questions: How reliable was the technology? How well did participants like the satellite-delivered activities? How much did participants learn? How cost-effective were the courses? Although space does not permit an elaborate treatment of these questions, some broad generalizations can be made.

The equipment used in course delivery functioned very well, with reliabilities of 94 to 97 percent for the two delivery systems, for both the transmission and reception of the various learning activities. Even more encouraging, however, is that when broken down by course, these figures improved with each course offered, which indicates that over time the system can maintain a very high level of equipment reliability.[2]

Data collected from background questionnaires, learning activity ratings, pre and post achievement tests and various other summative evaluation activities, indicate that participants liked the satellite-delivered learning activities as well and in some cases better than those provided in campus-based instruction.[3] Further, AESP course participants who completed the courses typically mastered course content, answering correctly 70 to 80 percent of the questions on the final examinations for the courses. Follow-up studies of the two summer courses also indicate that participants are applying in their classrooms many of the skills learned in the courses.

Regarding the cost of the satellite-delivered courses, it can be stated that the cost per student for even the modest scale of AESP operation (300 students at 15 sites) is competitive with that of campus-based instruction. At this scale of operation, the AESP per student cost ($2,070.37) is only slightly higher than that for a comparable course administered on the University of Kentucky campus ($1,694).[4] It should be noted that the AESP per student cost of $2,070.37 includes the average satellite rental figure of $1,000 per hour. This is an hourly rate that is presently available on commercial satellites. The Evaluation Component developed a cost model which allows for the determination of costs for various levels of operation. For example, the development, production, and course delivery costs - considering an audience of 1200 students, minimal reuse of the materials, and the simultaneous administration of three courses - are reduced to an estimated per student cost of only $350, less than a quarter of the campus-based cost.[5] Given that quality courses can be made relatively accessible to a substantial portion of the Appalachian population, the attractiveness of education by satellite is obvious.

It should be noted that these data have been misrepresented in some evaluations. A case in point is the final report prepared for the National Institute of Education by the Educational Policy Research Center at Syracuse Research Corporation. The intent of this recent report was to evaluate the Education Satellite Communications Demonstration (ESCD), of which AESP was a part, and to present a comparative analysis of alternative technologies used in delivering instructional television. In comparing the costs of satellite-distributed courseware versus other means, the former was grossly overestimated. The report estimated the satellite rental cost at $500 per hour, a reasonable figure. However, the cost to a school for one hour of daily programming assuming a 180 day year was estimated to be $90,000 (180 days x $500).[6] The stated implication is that a "very large" number of users are needed to reduce the per-user cost to an acceptable level. What should have been pointed out is that by spreading this over only 200 reception sites in an operational system, with five schools linked to each site, the cost is only 50 cents an hour for each school. This number of users is reasonable to expect, and the satellite costs are minimal. Even with half the number of users suggested here, the cost per user is small.

In this particular evaluation, the evaluators' lack of familiarity with the literature on satellite education systems is evidenced by the comment, "One perhaps surprising result of our analysis was that for very large ITV systems -- ones involving 200 participating institutions or more -- satellite delivery becomes less expensive than mailing videocassettes."[7] This has been known and published for over four years by Horley, Hupe and others. The problem was compounded by attempting to deal with the delivery costs for students K-12 and adult and continuing education simultaneously. To make this type of assessment, which does not have an adequate evaluation design, is undesirable. Let me now turn to what AESP has done over the past year of planning as well as its plans for the future.

Planning Phase (1976)

Following this successful experimental effort AESP entered a new phase during which plans were made to expand the diversity of programming, the range of audiences and the scope of its organizational structure. As in the past, this planning began with a needs assessment of the region to determine what needs exist in such areas as continuing education (e.g., workshops, seminars, conferences), adult education, in-service education, and undergraduate and graduate education for college credit. A first step was to document needs identified in a review of literature; the literature survey indicated that needs exist in Appalachia in the areas of education, medical and health services, government, business and industry, and human resources and services.

During the second phase of the needs assessment, AESP staff members went into communities in all thirteen Appalachian states and asked groups of representatives from each of the five needs areas: "What are your needs; could AESP serve these needs; if so, how"?[8] This input will be invaluable in planning programs for the next three to five years as a first step toward the ultimate goal of utilizing satellite technology as a tool for pooling and sharing resources among diverse community interests.

In response to the prioritization of needs for a variety of target audiences, an extensive review of existing courseware and materials was initiated to identify high-quality programming which meets these needs and to define gaps where new program development is necessary.

The AESP plans to deliver at least one program offering per year in each of the five content areas identified above. These programs may be undergraduate and graduate credit courses, mini-courses, workshops, seminars and conferences.

Regarding new program development, courses in each of the five areas are being developed. To develop the courseware, Resource Centers (RCs) such as Project PUSH (Parents Understanding Student Handicaps) in Keyser, WV, provide the content expertise and the facilities to produce and evaluate the materials for delivery via the AESP network. The AESP provides technical assistance and review in all phases of course development and conducts program-wide evaluation. As programming needs are identified, the Resource Center concept will be expanded and a mechanism to develop new programs will be devised and tested.

Another activity begun during the planning year was the expansion of the AESP network to include at least one Receiving Site (RS) in each of the 13 Appalachian states. In accordance with the long-range goals of a systems approach, agencies and institutions with diverse community interests and technical capabilities were encouraged to submit proposals to the AESP. The mechanism used for this was a request for proposal (RFP), which outlined broad criteria for evaluating proposals. The sites have been selected and a minimum of 15 new Receiving Sites will be installed by June 1977, with an additional 15 to be installed during the summer of 1977. At present, the focus of the AESP will be to modify the present cluster pattern, investigate alternative uses of technologies which the new sites offer to the AESP, and integrate these new agencies into the AESP organizational structure. A significant number of the Receiving Sites will provide access to cable systems and ITFS systems.

During the planning phase, the AESP continued to probe the capabilities of satellite telecommunications. In conjunction with the National Education Association (NEA), a two-way audio communication system, utilizing ATS-1 and ATS-3, connecting receiving locations in the South Pacific, Alaska and Appalachia was tested. Preliminary plans call for experimentation with the Communications Technology Satellite (CTS) to receive programs originating from the West Coast and then rebroadcast to the Appalachian region via ATS-6.

These and the previously cited activities of the 1976 planning phase laid the foundations for the current experimental-demonstration period and for the development of a four-year operational plan. The major research objectives and outcomes are outlined in an appendix to this paper.

Operations, 1977

ATS-6 again became available in January 1977 and AESP delivery began on January 25, 1977. Course activities currently underway include the delivery of the AESP-produced Diagnostic and Prescriptive Reading Instruction course for K-6 teachers. Also, AESP is cooperating with the National Education Association for the production of and participation in the Appalaska Project, a series of four live, interactive video broadcasts. A third activity to begin in April, 1977, is "Visual Learning", a short course for educators on the use of instructional television in the classroom. A final activity which began broadcast in March is a review of materials via satellite. Selected programs and materials from courses under consideration for future programming will be critiqued by content experts in the field and this feedback will be used in course selection and adaptation. With the high level of program activity proposed by AESP, it was vital that AESP secure and maintain its own ATS-6 uplink, to avoid the costs of landline delivery to an access station. Application was granted and an S band uplink was installed at the Taylor Education Building in January, 1977.

Support for AESP at the local level in Appalachian communities is obvious in view of the interest generated by the RFP for new Receiving Sites. At the federal level, also the need for public services such as those provided by AESP has been voiced. The Office of Telecommunications Policy in its 1976 report strongly advocates continued experimentation with rural broadband communication systems and cites AESP in particular as having the expertise and experience needed to coordinate such experimentation.

As AESP evolves it is necessary to move towards an operationally complete system in order to expand the training function of the project, and at the same time to include a significant experimental component in each course or training package developed so that more information is gained relative to educational uses of satellites. Based on the knowledge gleaned during the previous phase of AESP, further experimentation will take place within and among these target areas: technology, management, instructional activities, and funding mixes. For example, experimentation with satellite technology should be conducted regarding the amount of transmission time used for the efficient transmission of content and the amount used for interaction. Regarding the interactive capacity -- perhaps the most extraordinary feature of satellite delivery -- there needs to be more experimentation to find optimal ways of creating interaction among students and with the coordinating agency. Too, more experimentation with various combinations of learning activities needs to be undertaken.[9]

Perhaps the most critical aspect of this entire program is the base of financial support required for an entirely operational system. Various funding mixes will be investigated. Involvement of federal, state, and local organizations -- both public and private is a necessary objective of any expanded program. It is anticipated that the next several years will be a transition phase during which time a suitably effective marriage of public and private funding will be secured. It is hoped that this research will lend support to broadening the use of satellite communications by attempting to find the best possible combinations and coordination of its use for various purposes and audiences.

I hope that this presentation has provided you with additional insight into the potential of a regional satellite telecommunications system in providing needed services for a region such as Appalachia. In closing, let me say that we are pleased that we have been able to work effectively with local, state and regional agencies. We find that what we are doing is rewarding, challenging and exciting. The future of satellite technology opens doors that were closed just a decade ago. Our goal is simple, to provide the best possible delivery of continuing education activities and other needed information and services to those people who would otherwise not receive the opportunities made possible by satellite technology.

Footnotes

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6. *Instructional Television: A Comparative Study of Satellites and other Delivery Systems*. Final Report prepared for the National Institute of Education by the Educational Policy Research Center, Syracuse Research Corporation.
7. *Ibid*, pp. 21-22.
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APPENDIX

Major Research Questions

The major research objectives outlined in the operational plan are designed to provide the framework in which to seek answers to the following major research questions:

1. What continuing education programs will best meet the needs of Appalachian leaders in the five crucial fields already identified? What approaches offer optimal promise for the development of effective programming?

2. Can previously developed software be cost-effectively adapted to meet the aforementioned needs? What additional training programs and ancillary materials are needed? What factors must be considered in the development of new programming to insure maximal effectiveness and acceptance?

3. What are the best combinations of communication media to use in meeting the needs of Appalachian leaders and citizens in the five fields? How can satellite communications be made more effective in promoting beneficial change through improved channels of communications?

4. What communications system(s) hold(s) the best promise for meeting the continuing education needs of leaders and citizens working in the five major areas and who reside in a large geographical region where conventional communications are difficult?

5. To what degree is the courseware and delivery system generalizable or exportable to other regions of the country?

6. What will be the effect of an expanded satellite communication network on the proposed target audiences and on the AESP?

7. What influence does weather conditions have on proper functioning of the communications network? Do the attitudes of local site coordinators affect participant outcomes?

8. What alternative uses of communication satellites are possible and practical in meeting the continuing education needs of leaders and citizens in five major fields? What aspects of using a satellite communications system to meet such needs warrant further research? Is a hybrid communication system more effective in producing desirable outcomes than a "pure" satellite system?

9. What type of regional and local organizational structure will result in linkages to a wide range of agencies to maximize the utilization of existing resources and expertise in Appalachia?

10. What regional fiscal structure will provide the most effective transition from the support of the National Institute of Education to state, local and other forms of support?

Major Outcome Objectives

The major outcome objectives are as follows:

1. Given the AESP model for regional involvement, the Program will identify and test each year one or more approaches to meeting the needs of the Appalachian region in the specialized areas of education, medical and health, human resources, government, and business and industry. This objective will be accomplished by the end of the Program and documented in the AESP technical report series.

2. By the end of the Program, at least one or more major instructional programs developed before January, 1977, will be adapted for use in continuing education programming and delivered to each of the five target audiences. Accomplishment of this objective will be documented by descriptions of the revised instructional products developed by the Program.

3. When the Program is ended, the effect of one or more combinations of satellite broadcast, print, and other media on each of the five major target audiences will be studied and analyzed. Conclusions will be drawn as to their overall efficacy, especially in terms of meeting the overall continuing education needs of Appalachia. Results will be reported in written documents and will be validated as to correctness of research procedures.

4. Given previous work by the AESP, the new Program will, by the end of its budget period, have in place a prototype delivery system which has been judged, as a result of research and evaluation activities, to have promise for meeting the continuing education needs of leaders and citizens throughout a large geographical region where conventional communications are difficult. This system will consist, at a minimum, of satellite linkages between the AESP and 30 Receiving Sites plus a network of local site coordinators who can assist in the diffusion of new, effective techniques in the major areas.

5. Periodically, instructional programming and support materials, communicated by satellite and found to be effective in meeting the region's needs, will be assessed for their exportability to other regions in the country. A report will document findings and make recommendations.

6. By the end of the Program, the effectiveness of an expanded satellite telecommunication network to help meet the needs of five major groups at a low cost per person will be assessed. This will be certified as resulting from appropriate research and statistical procedures.

7. At the conclusion of the Program, the influences of weather conditions and local site coordinators on the effectiveness of the Program will be assessed and reported.

8. With completion of the Program, the effectiveness of four-channel audio transmissions, four-channel audio/video transmissions and optimal success of video tapes and interactive seminars in meeting the needs of the five target groups through continuing education courses/series will be assessed. In addition, two or more alternative linkages with other satellites and broadcast systems in forming a hybrid network will have been used to provide continuing education for Appalachian leaders and citizens. The hybrid system will be assessed and conclusions drawn as to its effectiveness, cost, and exportability.

9. When the Program is completed, the AESP organizational structure will be reviewed and alternative structures will be examined each time major expansion of the system occurs. This review process will be designed to develop an organizational structure that will utilize the existing resources and expertise in Appalachia.

10. By the end of the Program, the AESP will iden-

tify and assess one or more fiscal structures which will provide for an effective transition in financial support from the National Institute for Education to state, local and other sources of funding.

CREDIT COURSE INSTRUCTION VIA ETN: A CASE STUDY

Harland E. Samson, PH.D.
Professor and Associate Dean
School of Education
University of Wisconsin-Madison

Teleconferencing technology and technique have been the topics of numerous articles and papers in recent years. These reports have most frequently dealt with the rationale for such systems and the technical aspects of the installations. Much of the instruction delivered through such systems has been in the non-credit category. Non-credit programs are frequently one-time offerings. Those that are multiple-session programs are frequently a sequence of related but fairly independent single programs. For those who are planning a credit course for telephone delivery, information on prior program experience is limited. It is the intent of this presentation to provide a somewhat detailed description of the development and telephone delivery of a credit course. The information provided is not offered as a model of program development and delivery but is shared as an example of the considerations made, techniques used, and results achieved. It is hoped that it will provide some insights that will be helpful to others who may be faced with designing a teleconference based credit program.

Need Assessment

The course, "Principles of Vocational Education"*, had been offered as a graduate/undergraduate off-campus course in numerous locations throughout Wisconsin during the period of 1964 to 1971. The course was required for certification for teachers of vocational education at both the high school and the post-secondary level. The off-campus offerings were made at locations where there was reasonable assurance of an enrollment of 15 to 20 students (the necessary enrollment level depended upon the distance from campus and the expenses incurred in providing travel, hotel and meals for the course professor). Each year, requests were received from individuals in localities where the optimum enrollment might be anywhere from 2 to 8 persons. The continued expansion of vocational and technical education in Wisconsin high schools and in post-secondary institutes plus the normal turnover of staff gave reasonable assurance that such demands for the course would continue at least for several years. It was obvious that, with a limited amount of time by university staff to provide off-campus courses and the continuing need from individuals scattered across the entire breadth of the state, some means of serving this need other than traditional on site course offerings was essential. After checking data on teacher needs with the Department of Public Instruction and the Wisconsin Board for Vocational, Technical and Adult Education, a projection was made of about 60 enrollments per offering on a once a year basis. Actual enrollment has ranged from 52 to 137 in eight offerings over six years.

Orientation to Wisconsin ETN

The first ETN (Educational Telephone Network) offering of the course "Principles of Vocational Education" was in 1971. The Wisconsin ETN System was then in its sixth year of operation. The system is fully described in articles by Baird[3], Parker[6], Seaman[9], and Braun, Gilbertson and Hansen[4]. The "state of the art" in terms of instructional planning and course delivery were generously shared by the UW-Extension staff of the ETN system. Information on what could and could not be done and what had worked well for previous course instructors was examined and analyzed. Only one other course had been offered for credit prior to this time. Based on limited technical data and a good deal of faith, the faculty of the Department of Educational Policy Studies approved the offering of the course "Principles of Vocational Education" via ETN for both undergraduate and graduate credit.

The services provided by the staff of the Instructional Communication System and the community faculty of Extension and local program administrators were essential to the pre-planning, coordination, publicity and promotion of the course throughout the state. Because of the services provided by ICS and UW Extension (production, support, registration, library, evaluation and meeting facilities), the matter of actual course planning and implementation could be given primary attention by the instructor. A key to continued involvement of a given instructor in ETN instruction is to make sure that the system make minimal demands on the instructor. If the system requires much additional effort over regular on-campus instruction, the instructor is apt to "opt out".

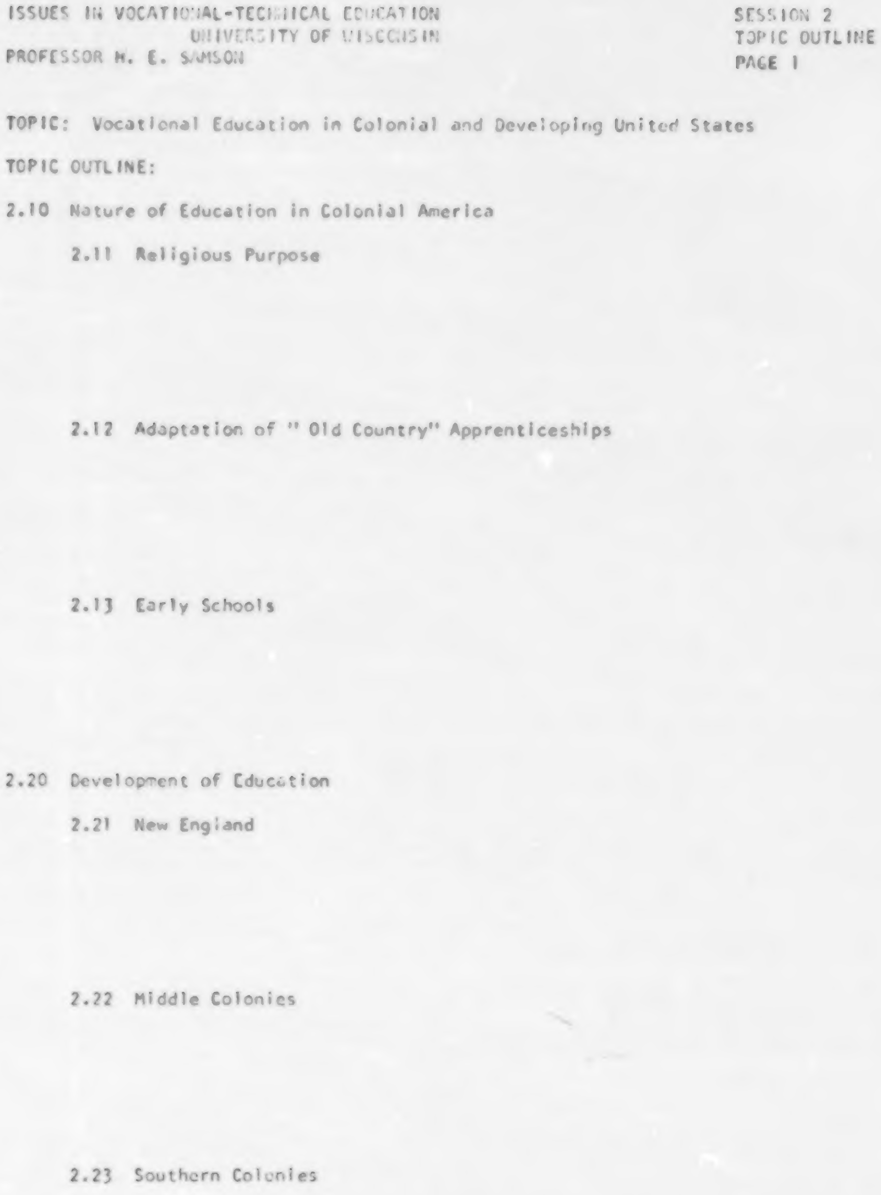
Course Planning

The discussion in the remainder of this article will represent a composite of the thinking and development carried out over 6 years and 8 semester offerings of the ETN course. While most of the initial planning did hold up over time numerous adjustments were made and techniques added primarily because of the input by students. Periodic course evaluation as well as repeated face to face sessions with ETN students revealed student preferences for certain practices and procedures. The usual preface by students to some suggested modification would be "considering the alternatives I sure would like to see....."

Course Objectives

Because this was a "certification" course, the objectives had been carefully established to meet expectations of the two state teacher certification agencies (Wisconsin State Board for Vocational, Technical and Adult Education and Wisconsin Department of Public Instruction). The professors of the "Principles"

*The title "Principles of Vocational Education" was adopted Fall, 1976 - prior to that the course was titled "Issues in Vocational-Technical Education".



ISSUES IN VOCATIONAL-TECHNICAL EDUCATION
UNIVERSITY OF WISCONSIN
PROFESSOR H. E. SAMSON

SESSION 2
TOPIC OUTLINE
PAGE 1

TOPIC: Vocational Education in Colonial and Developing United States

TOPIC OUTLINE:

2.10 Nature of Education in Colonial America

  2.11 Religious Purpose

  2.12 Adaptation of " Old Country" Apprenticeships

  2.13 Early Schools

2.20 Development of Education

  2.21 New England

  2.22 Middle Colonies

  2.23 Southern Colonies

Illustration I - Example of Topic Outline - usually 3 to 4 pages in length with suggested readings listed on last page.

course tend to meet periodically and review with state staff the content and goals of the course. The basis for the course offered over ETN was a list of 30 objectives based on state agency and inter-institutional consensus. For learner purposes, nine course objectives were listed in the course syllabus. Those enrolled were encouraged to send to the instructor their personal objectives which were treated as "add on" course objectives.

Organization of Course Content

The learner outcomes of the course, as represented by the 30 course objectives, provided fairly clear indicators as to the nature of the course content. The objectives leaned heavily toward history, beliefs, and procedures of the vocational technical education system. The content was organized chronologically, covering the development of vocational education in the United States. The major policies and practices of vocational education during each time period were covered with emphasis on the current period. Because of the weekly broadcast schedule of the ETN delivery, the course was divided into 16 major topics, one for each of the 16 broadcast sessions. The sequence of topics permitted the instructor to deal broadly with the first several topics, then, during the middle of the course, several topics were quite detailed and specific, and finally the last few topics were on a more global and generalized level.

Student Materials

The nature of student materials and their eventual use during the course was given considerable attention. Because of a heavy dependence upon verbal and prose learning, research associated with those two learning forms was given most consideration. Information, such as that which follows provided by Faw and Waller[3], was influential in student material design. Faw and Waller identify at least four important techniques that have been used to influence student activities in the learning situation. The four techniques are:

1. Prior presentation of ADVANCED ORGANIZERS to help students relate new materials to what they already know;

2. Instructions to take notes, underline key ideas, or employ other active RESPONSE MODES;

3. Provision of OBJECTIVES that specify what a student is expected to learn from a given unit of material; and

4. Periodic presentation of INSERTED QUESTIONS throughout a prose passage.

Upon receipt of his or her registration, each student was provided a course syllabus which consisted of the following items:

1. The course description;

2. The course objectives;

3. A statement of course design, procedures, and course grading scale;

4. Outlines for each of the 16 sessions, including:
   a. Topical outline of material to be covered;
   b. Recommended readings;
   c. Study questions associated with that topic;
   d. Additional information as appropriate in the form of handout pages;

5. A supply of weekly quiz answer sheets;

6. A supply of pre-paid mail-back envelopes;

7. A bibliography of related readings available from the UW-Extension Library;

8. A textbook order form; and

9. A 5 x 8 white card asking for information about the enrollee.

Four elements in the design of the student syllabus seem particularly noteworthy. These elements are:

1. The session outlines;

2. The weekly quiz;

3. The 5 x 8 informational card; and

4. The grading scale.

Integral to the design of the topical outlines used in each session was research on the value of advanced organizers to the learner. It was felt that if material provided to the learner over ETN was to be conceptually useful, it should help organize and clarify thought regarding the content being presented. A variation of Ausubel's "Advanced Organizers"[2] described by Posner and Strike[7] as "an interesting marriage of concept related and learning related bases" was the basis for the design of the material provided each learner. A sample of a session's topical outline is shown in Illustration 1. Studies such as that by Schnell[8] and that by Allen[1] provided additional encouragement for the use of advanced organizers - Schnell for the immediate value and Allen for their value in retention of material. The color of the paper used for outline, study questions and handouts and the numbering system provided easy verbal identification of the sheet and sub-topic being referred to at any point during the ETN broadcast either by the instructor or by the learner. For example, reference to Session 8, item 8.31 provided precise location of the topic being discussed. Rarely did any student ask for a repeat of which topic was being referred to.

The use of a weekly quiz was intended to provide communication between the instructor and the learners. As a result of initial experience, the weekly quiz was changed to a group quiz so that one response could be made by several students who happened to be enrolled at a single location (see Illustration 2). One of the questions from the list of study questions would be selected at the end of a broadcast and announced as a quiz question for that week. Students were asked to prepare a written response of no more than 150 words and mail immediately to the instructor. Logistically, with postal service operating at peak efficiency, a quiz could be mailed in, scored, mailed back to the

ISSUES IN VOCATIONAL-TECHNICAL EDUCATION
University of Wisconsin
Professor H. E. Samson

Course Location____________

Session No. _____ Date_______

WEEKLY QUIZ ANSWER SHEET

Instructions: At the end of each session broadcast your instructor will advise you of the question from the list of study questions (yellow sheet) for this session that he would like you to answer. You may discuss this question with other persons at your location and use reference material available. Write your answer to the question assigned in the space below. Do not exceed 150 words. (Question No.______)

Illustration 2 -
Weekly Quiz Answer Sheet -
group answer is encouraged but
"individual" response can be made

Each person who assisted in the preparation of the above answer is to sign his or her name to this answer sheet in the space below. If you disagree with the above answer you may submit a separate answer sheet with your answer. Place this answer sheet in the pre-paid envelope provided and mail immediately after the class session

Signature of participants:

________________________ ________________________

________________________ ________________________

________________________ ________________________

UW/HES/74

learner and received before the next broadcast. Practically speaking, however, in most cases quizzes tended to be returned to the students too late for follow-up discussion at the next ETN session.

The information provided on the informational cards permitted the course instructor to gain some insight into the background of each student. The cards, as initially returned, contained basic information: address, position, prior educational work and reason for taking the course (see Illustration 3). The card asks for both the home and office telephone numbers. This permits the instructor to have ready access to a telephone follow-up on any material that would seem to be better handled personally than over the ETN. This information was also used in the preparation of a directory which would be mailed to all students at approximately the third meeting of the course. As the instructor gleaned additional information about the students during the course, notations could be made on the card. Notes about the student's interests, current concerns or other matters help to personalize comments and questioning during broadcast time. By reviewing cards, the instructor could preselect which of the learners would be asked questions during the broadcast and which students would be most apt to add expertise to the topic scheduled for a particular meeting.

Course grades are based on a pre-determined schedule of points for each of the several activities. The grading scale is criterion referenced and published with the course syllabus. Students know from the first meeting what is expected for successful completion of the course and what level of performance will be necessary for each grade giving level. Grading elements for two credit enrollment include weekly quizzes, written analysis of an issue, and the final examination. For those enrolled for three credits, the additional requirements of a term paper and an oral presentation of that paper are included.

Course Requirements

Course requirements are described extensively in the student materials. Considerable time during the first session is given to explaining course requirements. Those few students who do drop the course most frequently claim difficulty in meeting course requirements. A clear understanding of course expectations from the very first session is essential. The way the weekly quiz requirement is handled might be a good example of 'plan' versus 'practice'. The course information sheet states as follows: "There will be a short quiz at the end of each session. The weekly quizzes are group quizzes with all members of a listening station discussing the question assigned and arriving at a group answer. The weekly quiz answer sheet should be completed and all members participating are to sign the sheet. Put the answer sheet in one of the pre-addressed, pre-paid envelopes provided and mail to UW-Madison immediately after the class session. The quiz will be scored and returned to the listening group by the next meeting. There will be no make-up quizzes given to those who are absent. Each quiz will count 10 points. The thirteen highest scores of the fourteen weekly quizzes will be counted toward the course grade. The total value of weekly quizzes equals 130 points." (Note: there is no quiz the first or last session.) If for any reason an ETN broadcast to a station is faulty, students at that station are sent an audio tape of the broadcast and students may complete the quiz on that session after listening to the tape.

Summary

Obviously the underlying rationale for the course planning rests heavily on verbal learning research. It is felt that such a base was appropriate because of the nature of the content and the ETN delivery where there was a minimal level of visual imagery. The audio medium and the printed medium had to serve as the primary vehicles for communication of information and ideas. Thus, the course materials and course design were planned to complement and supplement these established conditions.

Course Delivery

One of the key ingredients of instruction under any conditions is to keep participants at a high level of involvement during each instructional session. Even with generous student tolerance of "required" credit courses, the admonition of "if it isn't exciting to hell with it!" is doubly applicable to ETN class sessions. For convenience, course delivery will be discussed in three parts - strategy, techniques and organization.

Instructional Strategy

In order to meet the time expectation for a two credit course, the class must meet for a total of 1600 minutes during the semester. The students enrolled for three credits must meet an additional 800 minutes. The ETN broadcast time varied in different semesters from 60 minutes to 120 minutes per session. The optimum time for each ETN session appears to be 90 minutes although with judicious selection of techniques 120 minutes is not an unreasonable length of class time. Whatever the length of individual sessions, the instructor's lecturing or talking time should not exceed blocks of 12 to 15 minutes. The use of resource people is relatively easy with the ETN system. Telephone hookups can be made to any location and with three or four preplanned questions the resource person can be directed to those matters of importance to the class. Students can be assigned interviewing responsibility or their questions can be sent in advance to the resource person.

In order for the instructor to have personal contact with students, the origination points for each session may be rotated among regional locations in the state. Typically the instructor can set up about five regional meeting places and actually meet with each cluster of students three times during the semester. These regional meetings can be extended after the regular ETN broadcast time for additional discussion and clarification of course content.

Teaching Techniques

Involvement of students in discussion and drawing out with questions needs to start with the very first meeting and continue throughout the course. Planned questions by the instructor are essential - few good questions can be phrased extemporaneously during a broadcast session. Students can be asked to be prepared to discuss readings, local practice, or observed trends one or more meetings in advance. During a broadcast students can be given a "discussion break"

Course ____________

Name ____ Location ____________
Last First Initial

Credits ____________

Home Address ________________________________ Phone ____________

____
City Zip

Business Address ____________________________ Phone ____________

Position (title) ____

Occupational Experience (Summary) ______________________________

____

____

Bachelor's Degree. Where__________ What______________ When__________

Master's Degree. Where__________ What______________ When__________

(On reverse side (1) describe your present job, (2) give reasons for enrolling in this course.)

Illustration 3 - Student Information Card and several listening stations can be asked to summarize their conclusions or answers to questions raised. Use of the information provided on the 5 x 8 informational cards is extremely helpful to the instructor in orchestrating the learner interaction essential to successful ETN instruction.

Instructor Organization

Use of the ETN for credit course delivery requires that the instructor must have nearly all the details of the course firmly established prior to the beginning of the course. Resource persons, visual aids (slides and handouts), pre-taped inserts, and program origination schedule all must be set as to date and time. Although this amount of structure may seem to lead to an undesirable inflexibility, such is not the case. Within this structure, considerable variation can be tolerated if the instructor is willing to adjust and reorder priorities to meet the interests of students enrolled in a given term. Additional resource people can be added, additional readings can be assigned or circulated via handouts sent back with weekly quiz results, and different emphases can be given topics as the needs arise.

Evaluation

Evaluation is a continuing process in every sense of the term during an ETN credit program. The weekly quizzes, questioning and nature of discussions can give the instructor a sense of student progress - what content is coming through and on which topics review and repetition is needed. By encouraging students to write in personal messages and return them in the weekly quiz envelope, the instructor can maintain a reasonable sense of contact with individual learners. Where appropriate, phone calls to learners the day following a broadcast can add as much as an on campus student coming in during the instructor's office hours.

The end of course instructor evaluation, student success on the final examination, and playback of broadcast tapes can all serve as measures of the strengths and weaknesses of the instruction. Comparison of the ETN class with on campus classes using the same materials and examinations serve to assure that no gross differences exist between ETN delivery and the traditional on campus course delivery. Comparisons thus far between ETN classes and campus classes show no statistically significant differences in cognitive learning outcomes on this course. But, to repeat, the evaluation must be continuous as each offering tends to vary and the instructor can never take a particular technique or procedure for granted.

Continuing Concerns

There is little doubt that, through the use of the ETN, credit course work can be made available to large numbers of students that would otherwise not be served. Matters which are of persistent concern and need attention and research include the following:

1. How well does the ETN delivery serve the affective domain?
2. The ETN delivery is a slower process and suggests that some material extraneous to the syllabus may be omitted - how critical is this and is some of this unknown content critical to the student's latter success in other courses?
3. The logistics of registration and material distribution continues to be frustrating to both instructor and students. A better way frequently seems to be offset by new and uncontrollable factors.
4. Is this service to ETN students justifiable in light of the per student costs and alternative uses of the instructor's time?

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TELECONFERENCING STATION EQUIPMENT

Daryl P. Braun
Vice-President
Darome, Inc. - Harvard, IL

Introduction

The purpose of this paper is to review the requirements for telephone conferencing station equipment used on 4-wire private line and voice-grade dialed telephone circuits. Station equipment will be confined to that intended for groups of individuals at multiple locations. Further, it will be shown how present Darome equipment satisfies these requirements. Ideas on what improvements can be incorporated to improve the technical aspects of conferencing will be presented.

4-Wire Private Line Station Equipment

After seven years of experience operating Wisconsin's Educational Telephone Network, the Instructional Communications Systems personnel in conjunction with Wisconsin Bell defined the requirements for multipoint, private line station equipment. These requirements defined a product to be used in classroom environments with a primary goal of facilitating interactive learning at remote sites throughout the state.

The results of their study and experience demanded that their station equipment:

1. Be portable and self-contained;
2. Is easy to set up and operate;
3. Operate on 4-wire private line voice-grade telephone circuits;
4. Facilitates student participation in the classroom discussion i.e., interaction;
5. Have sufficient acoustic output power for classrooms seating up to 200 people;
6. Be a public address system for its own classroom;
7. Minimize acoustic and electrical noise;
8. Be reliable and easy to maintain.

Darome designed station equipment utilizing these guidelines. Darome, Inc. was able to respond to the design request because of circuits available from its line of modular sound equipment and prior experience in sound system design. The ETN station equipment, developed in two phases during 1973 and 1974, is commercially available today as a Darome Model 604 Convener.

To better understand the operation of the Model 604, imagine for a moment you are at the Walworth County Courthouse in Elkhorn, Wisconsin. This is the third in a series of four sessions on "Public Information for Clerical Staff of Social Agencies". Today you arrive early and observe Sally, the classroom facilitator, removing the Model 604 from the audio visual equipment room. She has no difficulty carrying the suitcase like unit to room 103 where the class begins in ten minutes.

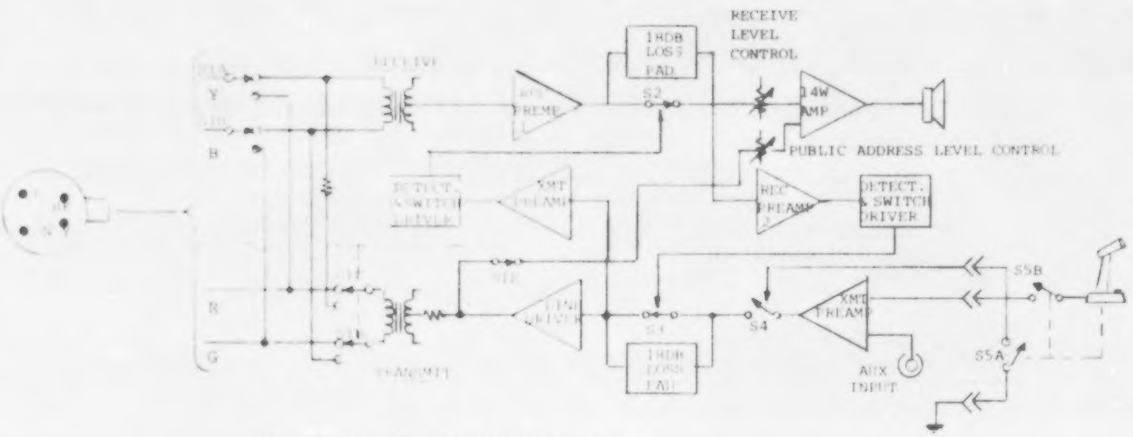
She sets the unit on the table in front of the room, opens the unit's storage compartment, and removes the cables. As she plugs the AC cord into a nearby outlet, she notes that the indicator near the volume control is on indicating that there is power to the unit. Next, she plugs the unit's telephone cord into a receptacle on the wall. Background music originating from Madison is heard. The connection to Madison is part of a state-wide 4-wire leased line circuit with outlets in 172 similiar classrooms. Sally adjusts the single control for a comfortable music level within the classroom and proceeds to set up the microphones at the tables in the room. The twenty foot cords facilitate the positioning of one microphone on each of the four tables. The microphones are rugged cast metal with a heavy base and sit upright on the table for easy access by the 12-16 participants.

The music stops and the course is introduced. After the introduction the instructor greets several students at various points on the network. As they respond it offers reassurance of others in attendance and encourages interaction.

After a brief lecture the instructor pauses to answer questions. A person across the room reaches out for the microphone, presses down on the drawbar, and asks the first question of the evening. A portion of the signal, which is fed to the network, is amplified in the classroom enabling those across the room to hear the question as clearly as those at other network locations. This short lecture, question and answer format, continues for the remainder of the third session. After dismissal you leave the room satisfied with your remote learning experience. The system had been remarkably free of annoying sounds frequently encountered with public address systems and certain telephone calls.

You wonder why? For a better technical understanding of the Model 604, consider the functional Block Diagram shown in Figure 1. The receive channel has a balanced line input transformer. The input receive preamplifier is compensated to attenuate signals outside the telephone line bandpass. The signal is passed directly from the receive preamplifier through S2 to the receive volume control, and from there to the 14 watt RMS amplifier. The cabinet contains two 8 ohm speakers wired in parallel. After S2, the signal is also fed to a second preamplifier that drives signal detector circuits which controls the operation of S3.

The signal source for the transmit channel is a high quality low impedance cardioid microphone connected to a voice compensated transmit preamplifier. With S4 closed, the signal passes to a 20 db loss pad and switch S3.



S1 - SPRING LOADED LOOPBACK TEST SWITCH
S2, S3, S4 - SOLID STATE SWITCHES
S5 - MICROPHONE DRAWBAR SWITCH

FIGURE 1 FUNCTIONAL BLOCK DIAGRAM MODELS 604, 611 CONVENER

With S3 closed the signal is fed unattenuated to the balanced output line driver. The signal from S3 also fed to a second transmit preamplifier that drives a detector circuit which controls the operation of S2.

To understand the design of the transmit channel, consider the potential acoustic problems with several hundred microphones tied to a common audio circuit. This dictated that the microphones be normally off. As seen from Figure 1, the internal wiring of the Model 431 microphone leaves the microphone element disconnected from the transmit preamplifier until the drawbar is depressed. This insures that the microphone in use does not activate the other microphones within the room. When the drawbar is depressed, S5B closes which in turn closes solid state switch S4. Having all microphones off eliminates audio pickup from the classrooms. Voice gated microphone operation was not used because the noise to be eliminated would operate the voice gate and pass the unwanted noise to the network.

Unwanted electrical noise on the network originates in the form of white noise at the highest gain point in the circuit. In this case it is the transmit microphone preamplifier. With potentially 175 conference units operating on an additive circuit the resulting white noise would prohibit any intelligible communication. For this reason, S4 is left in a normally open state blocking this white noise from all stations not participating in the discussion at a particular instant.

To achieve a good signal to noise ratio on the network the Model 604 must transmit a high quality signal. To achieve a good transmit signal, all the elements in a sound reinforcement system and their relative locations in the room, and the room acoustics must be considered. In Wisconsin's ETN classrooms, room acoustics had to be accepted for two reasons. The first being that in many cases the classroom facilities are not under control of the University, such as, those in hospitals, courthouses and munincipal libraries. The second reason is financial. The cost of acoustic treatment for some 175 classrooms would be prohibitive.

The elements of the sound system include the microphone, amplifier, and speaker. These elements must be optimized to eliminate two acoustic problems commonly referred to as echo and barrel effect. To the person at a network location listening to another person speaking from a second location, the listener experiences the illusion that the talker is at the bottom of a barrel. This problem is aggrivated by live rooms. The live room has a high content of reflected sound because there are insufficient absorbtive surfaces to dissipate acoustic energy. Consequently, the acoustic energy decays slowly, or the room is said to have a long reverberation time. The incident, or direct sound, is transmitted followed by transmissions of the reflected sound. The reflected sound is delayed from the incident sound and thus creates the barrel effect. Basically, the barrel effect occurs in two situations. First, when the transmit preamplifier gain is increased so the speaker can be picked up across the room from the microphone. With the gain that high, the incident and reflected sounds will be transmitted creating the problem. The second occurs when the public address level is set too high. The talker's incident sound is picked up by the microphone and amplified to such a level that the reverberant sound from the Model 604 amplifier/speaker becomes a significant portion of the sound incident to the microphone.

Minimizing these problems begins by selecting a highly directional cardioid microphone. The cardioid microphone responds well to signals directly on the front access of the microphone and the response drops off sharply on the sides and rear.

A second step toward achieving a good signal to noise ratio is to fix the transmit preamplifier gain. The fixed gain requires that the talker be within 12 to 18 inches of the front of the microphone to transmit an acceptable signal level. This restriction eliminates the first cause of the barrel effect mentioned above. Another benefit is minimizing the transmission of unwanted room noises during the time a talker's microphone is on. To the remote network listener, the talker's voice is heard at a considerably higher level than the background noise within the room.

Consequently, good signal to noise ratio exists. Additionally, the frequency response of the transmit preamplifier is tailored for speech intelligibility and telephone line compatibility.

To control the second cause of the barrel effect the public address level is adjusted by a control separate from the receive level. The public address level can be set at an adequate level for the classroom. As the receive is adjusted for comfortable listening level, the public address level is maintained at its desireable setting.

Echo is a common problem in telephone circuits. Through via net loss design concepts it is contained to the point where the user is virtually unaware the problem exists. Echo is that portion of a transmitted signal which is retransmitted by the receiving end of the signal path. This signal is delayed in time by the transmission path. The station equipment on ETN contributes to echo when a signal is received, amplified in the classroom, and transmitted back through ETN by an open microphone. The delay encountered is that time required for the sound to travel from the speaker to the microphone within the classroom. This echo is eliminated with the Model 604 by inserting 40 db of loss in each loop on the network which is a potential source of echo. 20 db of this loss is in the talker's receive channel and 20 db in the listerner's transmit channel.

This is accomplished in the Darome Model 604 S2 and S3 as shown in Figure 1. The switching operates as follows: With the microphone switch depressed and a transmit signal present, a portion of the signal is fed to transmit preamplifier 2 which in turn attenuates the receive channel by 20 db, that is S2 opens. The figure of 20 db was arrived by considering the number of stations involved, a typical number of microphones that might be in operation at a given time, and the amount of delay expected. The amount of loss required is proporational to the circuit delays. With satellite communications this loss must increase to 60 db total. The 20 db loss in the receive channel inhibits network signals from being received, amplified in the room, and retransmitted by the open microphone. To further understand the operation, consider a unit at a station where the transmitted signal is received, that is a listener's location. The listener's receive channel has a signal sensor. With the signal present receive preamplifier 2, the detector opens switch S3 and inhibits the transmit channel by 20 db in the same way the receive channel is inhibited at the station where the signal is being transmitted from. In other words, if a student in a listening room were to depress his microphone and attempt to speak with a signal present on his receive channel, his outgoing signal would be attenuated by 20 db.

The final design requirement concerns the equipment reliability and maintenance. With the extensive statewide network encompassed by ETN reliable operation was mandatory. The design began by using the latest in integrated circuit, solid state technology. All of the electronic components subject to failure are contained on a single, epoxy, plug-in printed circuit board. A customer's service department can replace the defective board with a spare and return the defective board to the manufacturer for repair.

As an alternate step the conference unit itself can be tested by activating the same loop back test switch. This shorts the units transmit pair to its receive pair. By turning the receive level control to maximum volume and talking into a microphone, the signal is transmitted and received by the same unit. While the audio is distorted by the echo suppression gating, it does verify the units operational integrity. This loop back test switch is a spring return slide switch. This provides a simple operator presentation and maintains the unit in its normal mode of operation.

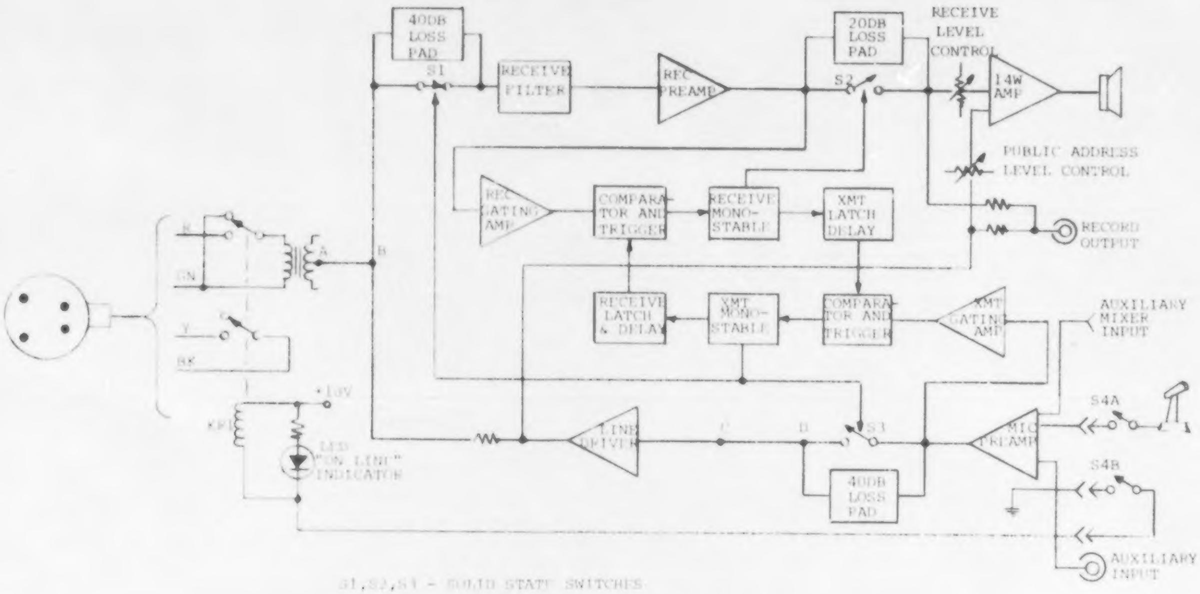
Two-Wire POTS Station Equipment

Two-wire station equipment used in conjunction with ETN to bring guest lecturers and instructors to the people of Wisconsin via the world wide dialed telephone network. Many of the design features applying to the 4-wire equipment apply to the 2-wire station equipment. Portability was a primary consideration since ICS ships the unit via common carrier to an off campus location for origination of an ETN program. Frequently the equipment is hand carried on commercial flights. The Model 680 carrying case which fits under a commercial airline coach seat, houses the Model 610 Convener, its basic 491 microphone and up to three additional Model 461 microphones.

To understand the operation of the two-wire station equipment consider the functional block diagram shown in Figure 2. The Model 610 is operated in conjunction with a standard telephone, which is used to dial outgoing calls and provide ringing for incoming calls. Transfer to the Convener is made by switch S5 on the Model 491 microphone. Operation of switch S5 closes relay KR1. This connects the tip and ring of the telephone line to the Model 610 and provides an auxilliary set of contact closures on the yellow and black leads of the telephone cord for A and A1 controls on key telephone equipment. As with the Model 604, the addition of a Model 603 mixer allows the use of four additional microphones.

With KR1 operated, an incoming signal passes through the balanced line transformer, normally closed S1, and the receive filter/receive preamp combination. If the signal is of sufficient amplitude, the preamp comparator and trigger circuit will pulse the monostable. The monostable output will close S2 and permit the signal to pass to the receive level control and then power amplifier. The monostable period is 100 milliseconds. When it is activated it latches the transmit comparator such that the transmit channel cannot be on simultaneously with the receive channel. The monostable is retriggerable. Any incoming signals of sufficient amplitude retrigger the monostable and reinitiate the 100 millisecond time period. Therefore, longest time the receive channel will remain on is 100 milliseconds after the last signal of sufficient amplitude to operate the gating. There is an additional delay in the order of milliseconds after the termination of the receive signal before a transmit signal can be initiated.

The transmit channel begins with a highly directional cardioid microphone similiar to the Model 604. The microphone preamp is voice compensated in the same manner as the Model 604's preamplifier. The signal from the microphone preamp feeds the transmit gating



S1,S2,S3 - SOLID STATE SWITCHES
S4 - MICROPHONE SWITCH
KR1 - PHONE TRANSFER DELAY

FIGURE 1 - FUNCTIONAL BLOCK DIAGRAM - MODELS 601, 610 CONVENER

preamplifier. This preamplifier provides frequency response shaping and drive for the comparator and trigger circuit. If the signal from the gating preamplifier is of sufficient amplitude it will trigger the transmit monostable. The monostable drive closes switch S3 and opens switch S1. With S3 closed the transmit signal is passed to the line driver and then to the telephone line. The transmit monostable is retriggerable and operates like the receive channel with a maximum of 100 milliseconds hangover time. Again there is a delay of milliseconds before the transmit channel releases the receive comparator. Besides the telephone line, the line driver provides signal to the PA level control which feeds directly to the power amplifier bypassing any receive gating. Many of the acoustic and electrical noise mitigating techniques employed in the Model 604 are also part of the Model 610. The transmit channel gain is fixed and the high quality cardioid microphone minimizes the pickup of room acoustic noises during periods of transmission. Note that the microphone element itself is not connected to the preamp amplifier until the drawbar is depressed. Once the drawbar is depressed, the voice operated switching takes over. Again, the talker is forced to be within arms length reach of the microphone to depress the drawbar. The voice operated switching was designed to be effective within that range. As the talker's sound pressure level at the microphone continues to drop below the acceptable limit, the gating functions intermitently, and then not at all. Having switch S3 open eliminates the primary source of electrical white noise, the microphone preamplifier. Since each microphone contains its own S4 switching, only those microphones in use will be a potential source of ambient room noise.

The Model 610 in the quiescent mode attenuates telephone line noise by 20 db. This 20 db loss is switched out of the circuit when S2 closes. With the receive normally off, telephone line noise below the gating threshold is virtually not heard. Distractions caused by telephone line cross talk are minimized as it is normally heard only during the presence of a signal with sufficient amplitude to operate the voice switch. Therefore, the listener is not able to focus his attention on the noise.

Echo on the POTS station equipment is eliminated by the simplex operation. That is, Model 610 is either in the transmit or receive mode, and therefore, cannot transmit a station receive signal or receive a telephone circuit echo.

From a maintenance standpoint, the POTS station equipment is completely solid state with integrated circuits for all major circuit functions. For maintenance and test reasons, the circuitry is contained in a single plug-in printed circuit board. G10 glass epoxy printed circuit board material was chosen for strength against abuse portable equipment must endure.

An LED indicates when the Model 610 is actually connected to the telephone line. The unit left on is equivalent to an off hook condition on a normal telephone. The indicator serves as a reminder to turn off after call completion.

Again the simplified controls include the receive volume control and the screwdriver adjustment for the public address level. Only one microphone (Model 491) is equipped with a switch to answer the phone line. For simplicity, all the microphone jacks are the same, allowing the special microphone to be plugged into any of the four jacks.

The success of these design efforts are reflected in the technical portion of the ETN student evaluation forms. Now in its eleventh year ETN is serving the 175 stations. During the 1977-1978 school year 171 program sessions are being offered. This includes 1355 individual sessions totaling 1,796 hours of ETN programming. Taking the 186 days in a school year multiplying by 15 hours a day and adding 4 hours for each of the 36 Saturday mornings of the period totals

2,934 possible hours of programming. Recall that ETN is a gigantic party line circuit. Because of this, it is restricted to one simultaneous broadcast of course material at any given time. Further, consider that the current 1,796 hours, will be the prime hours of the possible 2,934 hours available. While the courses on ETN are offered to all 175 locations, because of special regional interests, not all of these locations will have students signed up for a given course. With greater network flexibility an additional course(s) could be offered simultaneously. One form this flexibility might take is to transfer the unused portions of ETN to secondary regional bridging. These regional private line bridges could be accessed through the dialed network and associated conferencing equipment. The University Extension has the teaching staff and the technical manpower at the ETN Control Center to provide simultaneous programming.

Consider for a moment the needs of conferencing in business. Conferencing is conducted between regional manufacturing facilities, between a main bank and branch banks, a home office marketing and/or sales department to its regional branch offices, etc. These conferences include such items as management coordination, production scheduling, new product training, loan meetings between the branch banks, etc. Because of the relatively limited nature of this conferencing, and the distances involved, generally it is not practical to consider a multipoint private line telephone network.

The evolving ETN system and business conferencing have a common need; to use the POTS Telephone Network to achieve flexible conferencing.

POTS Station Equipment Improvements

While the present 2-wire station equipment has been used successfully in both educational and business conferencing, experience has revealed areas for improvement. On point to point telephone calls level problems are more tolerable because of the ears adaptability to a wide range of signals. However during a conference call, persons exchanging information create a direct comparison of one persons level to another. The first area for improvement then would be to eliminate most of these obvious level differences.

On the Model 610 the first step towards achieving this would be to add compression in the transmit channel. The compression function would be inserted between points C and D on the Block Diagram in Figure 1. While the gating sensitivity is adequate for pick up of the average persons voice within arms reach of the microphone, there is a considerable level variation as the same person moves to within inches of the microphone. The preamplification would be added to achieve a more consistent level from those persons speaking at arms length of the microphone. The compression point would be set to establish 0 dbm transmit level peaks on the Model 610. Note the gating would remain at the microphone preamplifier output and additional gain and/or compression would not be added prior to the gating pick off point. If it were, the increased gain in the gating channel would lower the sound pressure level required to gate the transmit channel on thus transmitting more room noises. It is also not desireable to have the compressor function prior to the gating. This would cause a constant shifting of the gating sensitivity at the microphone. A loud talker for instance would compress the gain of the transmit channel and then a soft talker would not be able to gate the system on until the compressor released the required gain. Compression in the transmit would help equalize the level at the station equipment output. This leaves two major areas for possible level problems. In the telephone line connection itself, and in the bridging equipment.

To better understand typical line losses consider the simplified telephone connection illustrated in Figure 3. Signal loss from the telephone to the

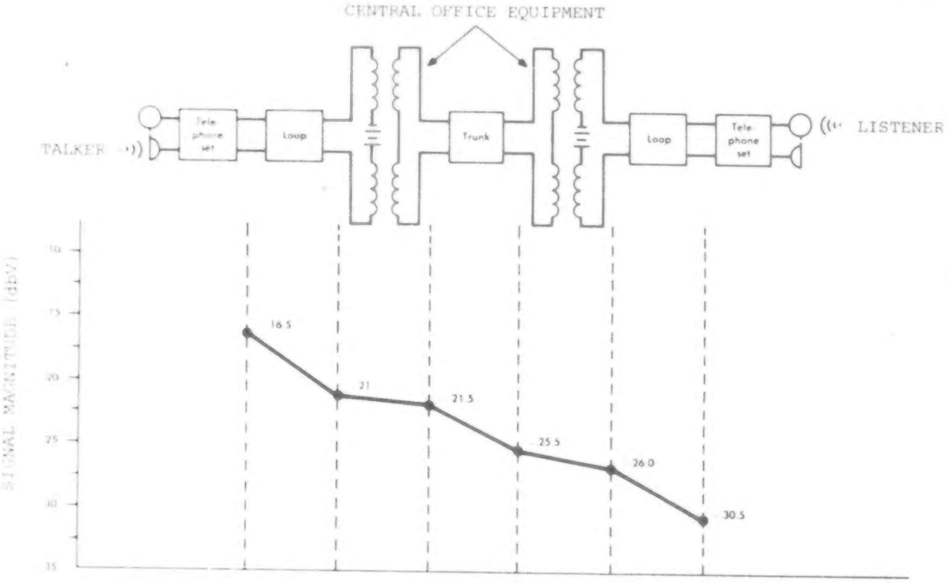


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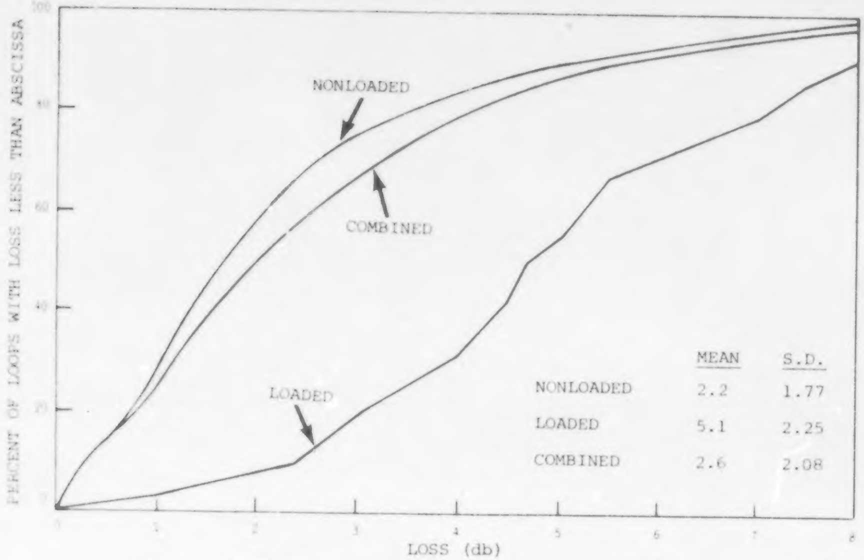
FIGURE 3 VOLTAGE LEVELS IN TYPICAL TELEPHONE CONNECTIONS



Reprinted from "DATA COMMUNICATIONS USING THE SWITCHED TELECOMMUNICATIONS" Bell System Technical Reference PUB 41005.

FIGURE 4 - 1000 Hz INSERTION OF LOOPS TO BUSINESS CUSTOMERS

central office is typically 4.5 db. The connection through the central office to the trunk circuit has a .5 db loss, 4 db loss in the trunk circuit, .5 db loss in the end office connection, and a 4.5 db loss from the end office to the called party's telephone.

Figure 4 illustrates the 1000 Hz insertion loss from the customers telephone to the end office. As shown, the combined loaded and unloaded signal lines have a mean loss of 2.6 db with a standard deviation of 2.8. For practical limits on level adjusting equipment consider two standard deviations from the loss limits. Two standard deviations would include 96% of all connections made. Using this criteria the customer equipment to end office connection would have a loss range from virtually 0 db to approximately 6.8 db.

Applying the same process to calls with a connection length of 180 to 725 miles (see Table I) and using the data between primary sites, the mean end office to end office loss would be 7.3 db with a standard deviation of 2.3 db. From mathematics, the standard deviation of the sum of two or more independent random functions is obtained by squaring the standard deviations of each of the functions then adding the squares and finally, taking the square root of the sum. Using this technique the 3 loss segments can be reduced into a single composite mean and standard deviation. Employing this technique results in a customer premise to customer premise mean loss of 13.5 db standard deviation of 4.58 db. Again using two standard deviations as the limit criteria this would yield a loss range from 4.34 db to 22.66 db. While the loss of 4.34 db is somewhat unrealistic for inter-office calls it could be number encountered in calls placed within the same exchange or terminating in the same central office.

All of the above is based on using only two standard deviations which in turn implies that one out of every 25 calls placed for conferencing would have to be replaced in order to get losses within the acceptable limits. Using three standard deviations the loss range would be from virtually no loss to a maximum of 27.24 db.

To achieve good conferencing these level variations must be minimized, if not eliminated. Where special station equipment is used for conferencing it would be practical to consider a unit with a self-test feature operated in conjunction with a micro-

TABLE I - COMPARISON OF CONNECTION LOSSES AT 1000-Hz FROM 1966 AND 1969/70 SURVEYS

Connection Length (airline miles)	1969/70 Survey				1966 Survey	
	Primary		Secondary		DDD	
	Mean (dB)	S.D. (dB)	Mean (dB)	S.D. (dB)	Mean (dB)	S.D. (dB)
All	6.7 ± 0.6	2.1	6.6 ± 0.3	2.1	---	---
0-180	6.5 ± 0.7	2.0	6.4 ± 0.4	2.1	7.0 ± 0.4	2.3
180-725	7.3 ± 0.4	2.3	7.1 ± 0.6	2.1	8.5 ± 0.6	2.5
725-2900	7.7 ± 0.5	2.5	7.3 ± 0.3	2.0	8.9 ± 0.6	3.0

processor controlled bridge to compensate these levels by actual tests, measurements, and adjustments.

One possible mechanization for this idea is shown in Figure 5. The functions between points A and B in Figure 5 would insert into the block diagram of Figure 2 at corresponding points A and B. After initiating an outgoing call or answering an incoming call the timing sequencer would be set to start. The test signal originated by the bridge would start the test cycle. The test signal bandpass filter would insert 14 db of gain prior to measuring the incoming test signal to compensate for the typical incoming telephone line loss. The bandpass filter output would pass to a peak detector and on to the sample and hold where the peak incoming signal level would be held as a reference for the level programmable oscillator. At the termination of the input test signal the timing sequencer would send an outgoing test signal from the level programmable oscillator. The signal, fed to the telephone line by placing S1 in position 2, would reflect directly the incoming test signal from the bridge. Next the timing sequencer would shift the level programming reference for the sample and hold circuit to a 0 dbm transmit level. Level programmable oscillator would then output 0 dbm to the line at the station equipment. The second signal is measured at the bridge. The first measurement gives the entire loop loss of the connection. The second measurement gives the loss from the station equipment to the bridge. By taking the difference in the two signal levels the loss in both directions of the connection would be available at the bridge. This information could then be used to set the appropriate gains in the receive and transmit legs of the bridge to equalize levels at the bridge. Telephone lines with loop loss in excess of predetermined limits would be rejected and have to be replaced. A simple noise test could also be incorporated at both ends of the connection. Lines would be rejected for excessive noise.

With the increasing availability of complex functions in integrated circuits, these techniques are not only possible but will be practical for people doing extensive telephone conferencing.

One of the more cumbersome aspects of this type of teleconferencing equipment is the microphone and its associate cabling required to facilitate participation. While the setup is relatively simple, the cords present a rather awkward site and inhibit the flow of traffic within a conference room.

Within the past year, Senheizer of Germany has demonstrated, and made available to the consumer market, stereo headphones for use with a home hi-fi system using wireless techniques. The main hi-fi receiver unit has an infrared transmitter with the infrared detectors attached to the headset. This enables the hi-fi enthusiast to be anywhere within the room and listen privately. The technique is relatively insensitive to direction and signal blockage even by placing a hand over the detector area. A reverse application of this technique to the station equipment would certainly facilitate setup and provide greater flexibility for student participation since the microphone could be passed around the room.

A second technique considered by Darome is to have a single microphone with a long cord reaching from the conference or classroom table to the convener itself. From this microphone additional microphones could be looped to the first one using three to four foot cords. This would make a single cable run from the table to the convener with a minimum amount of cable on the table itself.

A third possibility would be to combine the first infrared transmitting technique with the second. That is, have a single microphone on the table with the infrared transmitter and the other microphones on the table plug into that unit. The infrared transmitting microphone could have a rechargeable battery and the convener have the charging equipment.

These speculative improvements are not necessarily part of current engineering projects at Darome. They are presented to stimulate ideas on technical improvements for telephone conferencing.

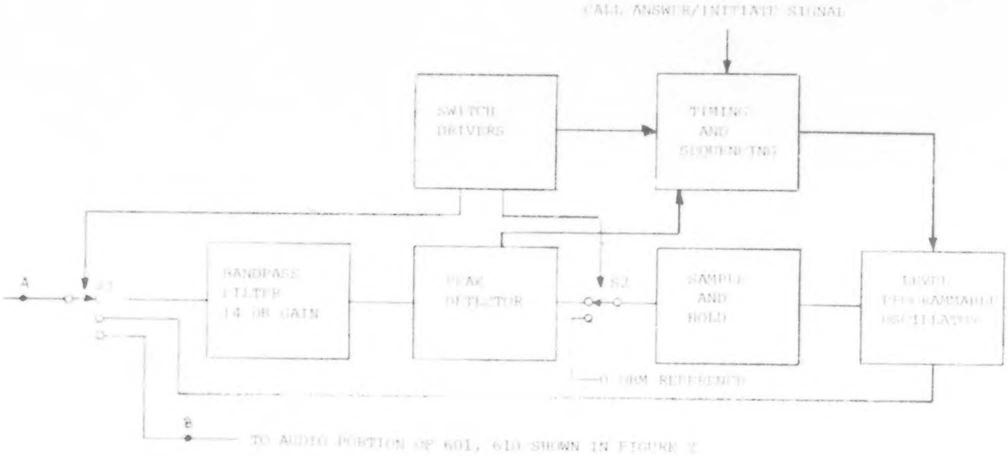

CALL ANSWER/INITIATE SIGNAL
SWITCH DRIVERS
TIMING AND SEQUENCING
A
S1
BANDPASS FILTER 14 DB GAIN
PEAK DETECTOR
S2
SAMPLE AND HOLD
LEVEL PROGRAMMABLE OSCILLATOR
0 DBM REFERENCE
B
TO AUDIO PORTION OF 601, 610 SHOWN IN FIGURE 2

FIGURE 5 FUNCTIONAL BLOCK DIAGRAM — LINE TESTING AND LEVEL ALIGNMENT

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"MEET-ME" BRIDGE

Henry C. Hansen, Engineer
Wisconsin Telephone Company
Milwaukee, Wisconsin

General

Telephone service has changed drastically since its inception. The machine to machine communications prevalent in todays society is the most recent service innovation made possible through the research and development efforts at Bell Telephone Laboratories. Somewhere along the path from service inception to service as offered today, the ability to interconnect more than two telephones in conference arrangement was achieved. Usage of this service offering grew slowly through the years.

The "Educational Telephone Network" (ETN) service is one of many private line telephone service offerings providing conference telephone service. This particular service has been under development during the last twelve years. Although the present arrangement provides excellent service features, users expect that continuing development will take place thereby improving or increasing the service features offered.

This rational exposes the need for continuing review of service objectives. Now that the presently designed educational network service is recognizing a degree of success, what improvements can be expected in the short range future. It becomes a rerun of the old story theme, "I appreciate what you have done for me in the past, but what are you doing for me now?

Improved Education Network Service Features

What More Can be Done for ETN?

Any service that is being offered today can be and will be improved. This includes each aspect of ETN e.g., administration; teaching methods; studio techniques; telephone technology. Since this is a telephone industry technical concepts paper, only changes to the telephone network which can be implemented either now or in the near future will be considered.

Three features of the present network layout could be explored for possible improvement. These features are: (1) Station Usage Time - How many stations are scheduled for each program? What can be done to utilize unscheduled stations? (2) Limit Program Access to Authorized Participants - How can unauthorized participants be locked out of the network? (3) Increase MTS Access with "Meet-Me" Conferencing Arrangements - Can unscheduled stations become a resource for small conference requirements by MTS interconnection?

Increase Station Usage Time

The nature of ETN is such that several participation groups are combined on one network. One group of participants relate to the hospital and medical professions. County agricultural agents form the nucleus of a farmer oriented group. Libraries provide a gathering place for a network participation group from the general public. University extension centers provide continuing education programming for a group made up of students and workers.

Because of the diversity of the audience, no one program appeals to all stations. The usual case would find no more than one-third of the stations scheduled for a program. This means that two-thirds of the network stations must be considered unscheduled or idle.

Unscheduled stations, that can be isolated from the main network program, are available for localized or even statewide secondary programs. Methods of utilizing this resource will be examined.

Limit Programs to Authorized Users

The free lunch has disappeared from the American scene. However, something resembling the free lunch is still available on the ETN. Every station that is connected to the network is receiving all network programming whether or not authorized participants are present.

The circuitry to eliminate this service fault will be reviewed.

Increase MTS Access - "Meet-Me" Conference

Unscheduled stations form a large resource of available access points for additional programming. Since the main scheduled program is utilizing the backbone of the ETN, interconnection of unscheduled stations seems improbable.

Interconnection through the "Message Telecommunications System" (MTS) may provide a means of utilizing unscheduled stations. At present this feature, under control of the studios, provides access to outside speakers, panel of speakers, or displaced students or conferees.

In the future "Meet-Me" conference bridges will be installed at regional centers which have access to Centrex switching machine service. These bridges will allow interconnection of isolated groups of stations into a combination usable for additional programming.

A "Meet-Me" conference bridge differs from those generally used today. Todays bridges are manually controlled by a control station or an attendant. People to people contacts accomplish the bridging functions. With a "Meet-Me" bridge the same functions must be accomplished mechanically, automatically, or with the aid of a computer. Feasible use of the "Meet-Me" concept will be presented.

Reconfiguration of ETN

Purpose of Reconfiguration

The present network design provides a group of interconnected stations which may collectively take part in one program. Any station users not interested in this program are denied use of their station. When two-thirds of the stations available for a scheduled program are in the unused state, consideration must be given to possible network reconfiguration alternatives. Alternatives which accomplish greater station utilization should be studied and if feasible they should be implemented.

One network reconfiguration design, which would provide the three improved ETN service features being considered, will be described. Other alternate plans will be explored in the future.

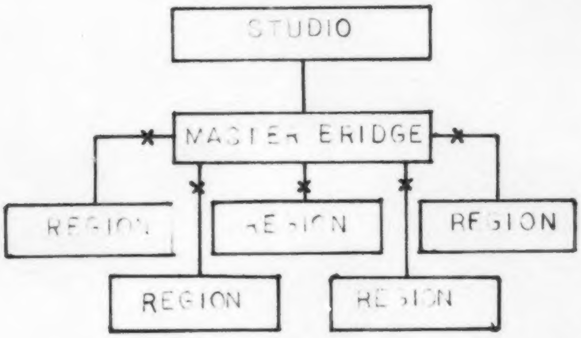
Development of Reconfiguration Requirements

Each program offered on ETN is directed towards a select group of stations. Access to the program is not limited to the select group but instead is opened to participants at any available station. All participation, however, is scheduled so that classroom, conference room, or auditorium may be made ready in advance of the schecule program.

The point is, stations, scheduled for use by program participants, are known in advance. The unscheduled stations, forming a list of stations available, may be considered for some other conference or program. The first step in utilization of unscheduled stations will be to isolate them from the network program if practicable.

Separating Scheduled and Unscheduled Stations

At Master Bridge. A region isolation circuit, consisting of a control circuit and relay per region, is part of todays ETN design. The function of this circuit is to provide fast restoration of the entire network when one region is affected by noise. Operation of a switch at the studio control room disconnects the offending region and starts restoration procedure. This restores the other nine regions to service while it implements maintenance procedures to restore service to the affected region. (Figure 1)



x - REGION ISOLATION SWITCH

FIGURE 1

Knowing which regions do not have stations scheduled for use, would allow operation of that regions isolation control circuit during the entire program. All stations in the unscheduled region thereby, are isolated from the main program and available for other programming. Programming would be limited to origin from one of the stations within the region. However, special arrangements of the master bridging circuitry would allow additional studio to unscheduled network feeds. (Figure 2)

Under the special master bridge arrangement studio feed A would carry the scheduled program to each region having a scheduled station. Studio feed B would carry other programming to each region which did not have a station scheduled for the scheduled program.

The transfer logic would be controlled by control signaling channels between the studio and the master bridge. In a typical operating situation each region would be in one of three conditions: (1) Connected to "A" master bridge; (2) Connected to "B" master bridge; (3) Isolated from both "A" and "B" master bridges.

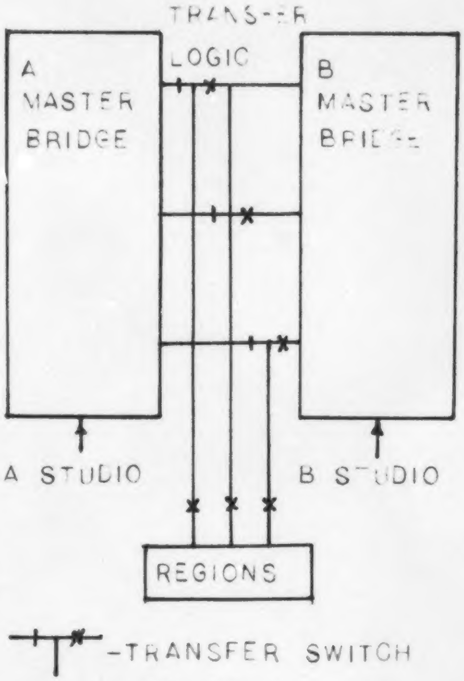


FIGURE 2

At Regional Bridge. A similar approach may be used to isolate unscheduled stations at regional centers. Since individual stations, as well as, secondary bridges would require isolation, some additional circuitry is needed. First, a signal circuit, interconnecting primary bridges at the regional centers to the studio, would provide the input to a wired logic panel. In turn, the logic panel would control the transfer relays. The transfer relays would connect each station or secondary bridge to one of two primary bridge circuits. The main primary bridge circuit would then feed the studio program to scheduled stations. The auxiliary primary bridge along with the unscheduled stations would then be isolated and available for other programming.

To be practicable each auxiliary bridge would require access to other auxiliary bridges or to be accessible from stations on MTS. This could be accomplished by interconnecting auxiliary bridges to "Meet-Me" bridges located at Centrex Offices within the DAIN (State Telephone Network) System.

The two minor changes suggested would provide the first two improved ETN service features.

(1) Multiple program feeds to make better station utilization feasible.

(2) Lockout of unused stations thereby providing privacy for authorized users of a scheduled program.

In addition to this, the network is now configured to make use of "Meet-Me" bridging.

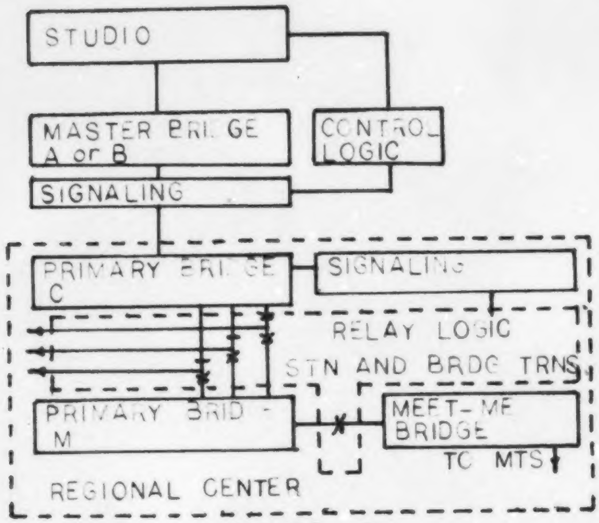


FIGURE 3

Adding "Meet-Me" Conference Capability to ETN

What is a "Meet-Me" Conference? When a group of people desire to confer by telephone, conference service is their best alternative. Normally one of the parties involved would: (1) Contact a conference operator or control station; (2) Pass along the conference details, names of parties, telephone numbers, starting time and probable length of conference; (3) Hang up and wait for call back from conference attendant.

The conference attendant would do the individual dialing, handle failures of equipment or people, make every effort to start the conference on time. The conference attendant will spend many minutes, per conference participant, to set up a successful conference call. Sometimes an advance conference scheduling call is warranted. Conference costs, such as, toll charges and conference charges, are billed to the party originating the conference call. The delays involved in conference attendant set up of conference calls cause users to turn to alternate methods for conferencing.

Contrast this to the "Meet-Me" concept. In this case the conference is scheduled for time and duration. Conferees are notified in advance along with agenda and calling details. At conference time, each conferee initiates a call to the conference telephone number. The "Meet-Me" bridge control circuits interconnect each authorized conferee to the bridge. Within minutes of conference start time, all conferees are on line ready to go. Delays are minimal, conference charges are shared. (Each party originating a call pays his portion of the cost.) Responsibility for taking part is shared by each party involved.

"Meet-Me" Interconnection. To be interconnected to a "Meet-Me" bridge, a station on MTS would dial the telephone number assigned to the "Meet-Me" bridge. When the Centrex Central Office serving the bridge received the call, it would test the line associated with the bridge and start the telephone ringing cycle. The bridge line logic circuitry would then go through a series of steps to complete the call.

--The incoming ring signals would be sensed by the "Meet-Me" fixed logic.

--Upon receipt of the second ring, the logic circuit would furnish a short across the line to operate the ring-trip feature in the Central Office.

--Ring-trip would discontinue the ring signal and cause the office to cut-through the switching network between the calling party and the bridge port.

--The interruption to Central Office battery caused by cut-through would initiate hand-shake tone, placing a two second 1500 Hertz tone on the line.

--The MTS station designing interconnection would complete the hand-shake by operating the (*) key on a touch-tone pad.

--The wired logic circuit would recognize the touch-tone and cut the incoming call through to the bridge.

--If the hand-shake is not accomplished within five seconds of the end of 1500 Hertz tone, the logic circuit will abandon the call by removing the short from the incoming line circuit.

Bridge Characteristics. Each "Meet-Me" bridge would consist of a six port bridging circuit with a four-wire ETN interconnect port plus five two-wire telephone number ended ports. The bridge itself would be capable of interconnect to the type of trunks normally found on the trunk link frame of a centrex serving central office. In addition interconnection between the bridge and centrex or MTS stations would be feasible. To do all of these tasks each leg of the bridge would have several designed transmission features.

1. Compression or limiting amplifier to equalize the different talk signal levels experienced on MTS.
2. Noise gate on the receive amplifier leg to open leg until a signal level above 35 dBrnc is received.
3. Cross-gating between bridge transmit and bridge receive legs to protect against echo or singing conditions on the bridge.

Network Service Features. The "Meet-Me bridge will provide several network service features to enhance programming capability of ETN. The bridge may be used (1) to interconnect regions for a program; (2) to allow the studio to feed the stations on the primary "M" bridge with program over MTS; (3) to provide guest lecturer, panel of lecturers, or displaced students or conferees for additional programming.

In addition to enhancing the ETN, the "Meet-Me" bridge can be used on a stand alone basis for small conferences or programs. Ultimately the "Meet-Me" bridge will be controlled by a microprocessor with software to vary logic characteristics and stored program to provide additional service features.

Summary

Now is the time for ETN to discard the one at a time program format being used today. In its place simultaneous programs can be implemented over an enhanced private line network. Additional usage can be realized over MTS and the "Meet-Me" bridge. Combining MTS, ETN and the "Meet-Me" bridge adds still another dimension for additional programming.

Microprocessors are available which can perform the software logic control required for administration of this multifaceted service. Although relay and wired logic were presented for immediate implementation of this plan, it is entirely probable that they will be superceded by computer control prior to implementation. The telephone industry is ready and willing to adjust to the needs of our educational institutes. The end result of this effort should be maximum programming capability per dollar spent.

ORGANIZING FOR INNOVATION AND CHANGE IN HIGHER EDUCATION

W.A.S. Smith
President
Athabasca University

Despite my pleasure at being here, I must at the outset of these brief remarks share my considerable mystification as to what brought me here. Yes, I am familiar with the superficial explanation which suggests that having a senior member of my own professional staff on the program committee may be a related if not causal variable and I can see a simplistic rationale in the notion of this organization and that of Athabasca University sharing some value level concerns. I am even prepared to concede that there may still be in some dark obscure corners of the world persons for whom the presence of a university president, no matter of what or where is still a matter of some moment. But all of those efforts at explanation or indeed rationalizations (in the defense mechanism sense of that term) really do not wash, you see, since I have it on good authority from a member of the executive of this organization that all these reasons were presented and rejected as neither necessary nor sufficient reasons for the invitation being directed toward me. Now these kinds of things worry me and at the risk of misusing your valuable time I want to share with you quickly the only sensible explanation that I have been able to come up with as to why I am here. It requires the invocation of a theoretical beak through of some years past which appeared in an article under the title "Parkinson's Law, The Peter Principle, and the Riggs Hypothesis - a Synthesis". Most of you will remember that the essence of Parkinson's Law is that Work expands so as to fill the time available for its completion. Parkinson illustrates this law in a variety of organizational contexts, an implication of which is that the number of personnel in an organization is bound to increase regardless of the amount of work to be performed. The Peter Principle suggests that "In a hierarchy, every employee tends to rise to his level of imcompetence." Again the evidence for the validity of this principle is experiential. In short you must ask yourself the rhetorical questions: "have you ever known anyone in authority in a bureaucracy who wasn't imcompetent".

Now Riggs comes along and snthesizes these apparently unrelated generalizations. He asks "What determines the amount of time it takes an employee to complete a given volume of work? It is here that the area of synthesis becomes apparent. A given quantity of work may take five minutes for the competent employee and several hours for the incompetent. Naturally the incompetent incumbent, requiring vast amount of time to perform even routine chores, will feel the need for subordinates since he has not the time himself to complete the work given him. Since by the Peter Principle we know it to be the nature of hierarchies to promote employees to their levels of incompetence, it is obvious that more and more subordinates will be required as more and more employees are promoted to their levels of incompetence. Indeed, even before the management level employee is raised to his level of imcompetence he will be requesting assistance, because incompetence rather than being rectinlinear as Peter is curvilinear approaching maximum incompetence as the employee is promoted... Peters failure, argues Riggs, "stems from his view that incompetence becomes apparent only when a person is promoted to that job level for which he is as it were ideally incompetent." Riggs argues and I quote again "My hypothesis suggests that a typical progression might be from competent line worker to slightly incompetent foremen to maximally incompetent supervisor. Incompetence tends to increase with the level of work performed and naturally the individual staff needs will increase as the level of incompetence increases."

Riggs concludes by suggesting that "it is unfair to both the organization and the employee to permit the employee to languish at his lowest incompetence curve without finding out whether he can be incompetent at some higher level position." I suggest then that in inviting me, the program committee, perhaps unconsciously, was motivated by a desire to provide me with the opportunity to move to a new and still high incompetence curve.

Two quick addendums to this ridiculousness. Egomanically I call them "Sam's Corollaries": (1) in order to have access to a new, potentially higher level curve of incompetence, one must not engage in attempts to disarm listeners by excessive public displays of ones weaknesses; (2) the psychomotor skills required for moving up the ladder of incompetence are a straight-ahead, non-faltering stride coupled with an ability to leap from ladder to ladder without losing horizontal position, indeed, ideally while increasing the vertical distance from the point of origin.

But enough silliness!

I do have some things that matter to me that I want to talk to you about today and while they are scarcely focused with pin point precision on the theme of this conference, I suggest that the motivation that binds us together is our common concern with improving the teaching-learning process while simultaneously making the opportunity for learning available to an increasingly broad audience. It is my intent therefore to talk with you in the context of the theme "Organizing for innovation and change in higher education", a theme that is old hat in a sense, but surely ever current and deserving of unending examination, re-examination, and improvement.

My interest as a psychologist in organizational theory immerged some years back as an outgrowth, regrettably after the fact, of some trial by fire exposure to the dynamics of that strange human organization that we call the traditional university. These organizational psychology concerns led me four years back to propose to the Canada Council that a nation-wide survey of university governance was in order. Now this survey has limped along for the past four years largely as a function of my own inability to resist the opportunity to change organizational contexts. However, the study has thus far prepared short synoptic histories of all the legislation covering the governance of the universities in Canada since their inception, and has collected via that questionable social science survey research instrument known as the questionaire a series of responses from Western Canadian universities which permit preliminary and heavily qualified comments as to the difference between the manner which institutions in fact function or govern themselves and the way in which they are described as operating in their legislation. But it is not my intent to regale you with an attempt at a traditional social science convention report. Instead I want to ramble anecdotally; and in case study form, talk to you about my most recent experiences at Athabasca University as a way of relieving myself of some platitudes as to the manner in which those of us concerned about continuing to improve and broaden the university educational services that we provide might organize ourselves.

At the outset then just this much about Athabasca University. Formally, Athabasca University is the fourth provincial university in the province of Alberta charged with providing university level educational services to anyone in the province who for whatever reason is unable or unwilling to avail himself of those opportunities on the three campus based institutions. Less formally, we fly under the following banner, or if you will subscribe to the following meta-objective: Athabasca University will seek to provide educational services at the University level in whatever form and whatever place can be determined to be required in the meeting of genuine educational need. That is of course better heard with violins or perhaps even more appropriately stirring band music in the background.

Now what have we done? In roughly five years of existence, we have spent approximately 5 million dollars of the tax payers' money, we have served approximately 1500 students, with some eight home study distance delivery courses making use of mixed media packages and we have provided traditional classroom "live instruction" to some 100 students located to the north and east of the metropolitan district of Edmonton. We have as well provided the beginning of a credit co-ordinating service for students attempting to bring together formal and informal experiences obtained elsewhere and to provide them with counselling service which will enable them to move toward their academic goals insofar as they involve university level activities. Where university level study is not indicated, we have tried to put students in contact with other more appropriate educational services.

Although false humility may be among the most distasteful of human behaviours to witness, let me risk nauseating you by picking up the theme of mystification that I waxed silly in developing at the outset and say with a little less tongue-in-cheekness, that it wasn't till I happened on the proceedings of a 1974 conference focusing on External Degree Programs sponsored jointly by the Educational Testing Service Office of the New Degree Programs, the University of California Extended University, and the California State University and Colleges Commission on External Degree Programs that I found a rationale which provided me with a seriously satisfying explanation for the decision of Athabasca University to extend the invitation to me to be its second President almost a year ago now. In those proceedings, Steven K. Bailey, then Vice President of the American Council of Education gave this advice to those who would attempt to develop educational institutions devoted to innovation,

> "...Plan your campaign. Look hard and realistically at the hurdles to be over come, the fears that must be tempered, the antagonisms that are predictable, the allies that you may be able to pick up along the way, the methods and instruments of communications at your disposal. Look around especially for those conservatives with a liberal tinge -- those who have enormous academic and administrative respectability yet who are not afraid of the future. (underscore "respectability", not "ability") These are rarely original types. You are the original one. But the liberal conservative is an indispensable blocking back. He can take out your interference. He may be a trustee, a college president, an academic dean, a department chairman. But he or she may also be a chaired professor, or even a lesser light who in a quiet way conveys the charisma of dynamic prudence. If you find such persons latch on."

Granted then that my credentials for serving as the chief executive officer of an institution devoted to educational innovation can be challenged, and even more explicitly my authenticity as a key note speaker in a conference devoted to the use of that particular piece of technology that we call the telephone in education, is virtually non-existent, I do assert with a pride that I have been at the business and art of administration in the university world for some years, that I have, through my professional background as a psychologist, acquired some understanding of human institutions and organizations, even a little bit or organizational theory and systems understandings, and that I am trying to make those bits of competence effective in the continued development of Athabasca University.

Lorne Parker intimidated me via (wouldn't you know it) the telephone way back in February, and thus I will not wallow as extensively as I would personally like in the comfortable bath of organizational theory and applied social psychology. Instead, I intend to briefly summarize what we have done organizationally at Athabasca University and then plagiarize three sources shamelessly in preparing a list of criteria or, less pretentiously, rules of thumb against which to evaluate any non-traditional educational services, but in particular university level services organized in independent institutions--and to use Athabasca University as a kind of case study for such evaluative comment. In short, in what I hope will be useful ways, I want to describe the horror, the joy, the failures, the successes, the meaninglessness, and the ultimate sense of meaning that have been and continue to be our lot at Athabasca University as we have tried to bring an educational opportunity to new and wider audience in the frozen north.

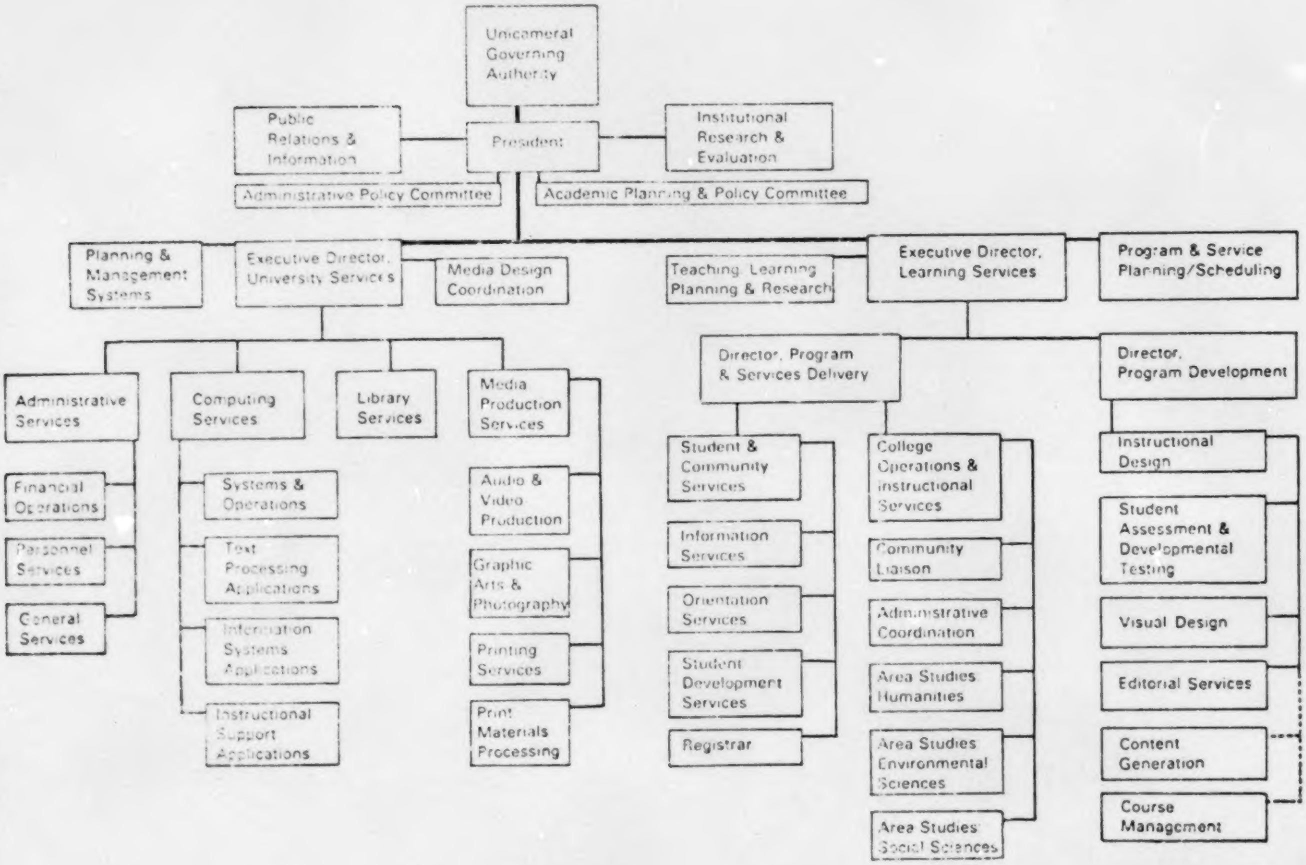
Since October 1976, we have addressed ourselves to the issues and problems involved in reorganizing a new university to meet functional needs, while attempting simultaneously to recognize the critical importance of the interests and motivations of the existing staff. In short, we've tried to create and implement a new world without committing the fatal error of assuming that one could risk ignoring either history or context.

In attempting to do this we moved through three distinct phases. I must concede that these phases are more easily discernible in retrospect and that the accusation of perjury would not miss the mark very far if I were to assert in a legal context that we set out to move the institution through these three phases: First an evaluation was made of the institution's goals and objectives and its relative success in achieving them to date. In brief, we essentially reaffirmed our commitment to the goals and implementational mandate that had evolved over the past three years for Athabasca University. Our meta values, were to provide a university level educational service that would foster personal growth, the development of informed, useful, participating citizens, and facilitate the development of human community. Unpacking those into objective and implementational terms caused us to come up with that gross and doubtless grandiose theme expressed earlier:

> "Athabasca University will consider its mandate to be to respond with university level educational services to any legitimate educational need not now being met by existing services and institutions. The delivery mode used by the University will as far as possible be determined solely by the particular learning context.

Now depending on what you do with that kind of mandate, it can either be, as my English friends put it, the biggest load of "codswallop" of all time, or a fairly inspirational, forward looking, imaginative, institutional banner around which to rally. Thus far, as noted, what we've done with it is to provide some eight university degree courses at the undergraduate level, and largely in the liberal arts domain; initiate a credit coordinating function whereby both formal and experimental work obtained at other institutions can be assessed and counselling to individual students provided, (enabling them to work out effective routes for their own educational goals, whether they involved the obtaining of undergraduate degrees or not) provide university level "live" instruction to remote community college districts which are currently without a "university presence", initiate planning for a learning institute designed to provide a province wide research service in the teaching/learning process, begun to plan for modular campuses capable of serving full time students but making use of instructional design - learning system approach and that the institution will follow, and establish a network of learning centres and local course tutors to serve our students. We have for our current offerings some 1,200 course registrations. Our organizational chart in more traditional bureaucratic terms looks like the following chart:

Athabasca University: Organizational Structure


Unicameral Governing Authority
Public Relations & Information
President
Institutional Research & Evaluation
Administrative Policy Committee
Academic Planning & Policy Committee
Planning & Management Systems
Executive Director, University Services
Media Design Coordination
Teaching, Learning Planning & Research
Executive Director, Learning Services
Program & Service Planning/Scheduling
Administrative Services
Computing Services
Library Services
Media Production Services
Director, Program & Services Delivery
Director, Program Development
Financial Operations
Personnel Services
General Services
Systems & Operations
Text Processing Applications
Information Systems Applications
Instructional Support Applications
Audio & Video Production
Graphic Arts & Photography
Printing Services
Print Materials Processing
Student & Community Services
Information Services
Orientation Services
Student Development Services
Registrar
College Operations & Instructional Services
Community Liaison
Administrative Coordination
Area Studies Humanities
Area Studies Environmental Sciences
Area Studies Social Sciences
Instructional Design
Student Assessment & Developmental Testing
Visual Design
Editorial Services
Content Generation
Course Management

Despite all these achievements, (and they are considerable and largely attributable to the group that preceded me of whom it is politically valid to say that our survival was largely attributable to the genius Tim Byrne, the former president. It is also fair to observe that our accomplishments have not been remarkable in the context of resources expended. The government has just indicated that our budget for the fiscal year 1977-78 will be approximately 60% over that awarded us in 1976-77 (where the other universities in the province were required to maintain a maximum 10% increase over their 76/77 budget) but has also said to us, ever so subtly but will dramatic directness, that additional quantum leaps in fiscal resource will only occur when we have demonstrated our capacity to do something with the resources thus far given to us. So clearly our lead time, our front end loading rationale has come perilously close to its terminal point.

Phase one then, the evaluative phase, left us with a kind of paradoxical if not schizophrenically joyful sense of impending doom. In short, we've done something, but we haven't done enough and as we looked at our accomplishments it seemed to us that the existing organizational structure needed radical surgery in order to permit us to do more. So the outcome of the review, analysis and evaluation phase was the decision to radically reconstruct the formal administrative and governance structure. As is evident in the organization chart, our structure differs substantially from the traditional university model. Rather than adopting the conventional academic structure using an essentially bicameral system involving an academic senate and a board of governors or trustees, our model more closely resembles a production and marketing organization in the service sector, that is, it concentrates significant authority and responsibility in the office of the president, it introduces a genuinely unicameral governing authority, it builds in legislative safeguards against misuse of power by insuring through the unicameral body the consent of the governed and it establishes organizationally distinct but functionally integrated separate program production and marketing of delivery units.

The second phase, while it can be described more briefly, required an equal amount of time and energy, and involved the formulation of a strategy for effecting or implementing the proposed reorganization. This strategy itself involved two subphases: first obtaining general staff consensus and second, refining and further modifying at a detailed level the changes through an enormous and virtually unending series of individual staff consultations. We think that there is a modicum of novelty in this strategy in that it makes open use of the consensual and consultative decision-making process typical of traditional faculty dominated university governance schemes, while doing so in the context of an essentially production and marketing oriented organization. In short, we were able to organizationally place enormous and virtually corporation president authority in the office of the president of the university, and to achieve acceptance of the right to exercise that authority, but did so via a consensual and participative process.

Our current development in addition to gearing up and getting ready to develop and deliver a wider range of educational services, not limited exclusively to formal degree credit courses, consists of focusing on the implementation of mechanisms for monitoring, evaluating, and where necessary changing the current structures.

In short, we intend that Athabasca University shall continue to be an experimental institution which approaches its educational mission in a flexible, responsive and systematic manner. If there is a truly unique wrinkle in the way we are approaching our task it is that administratively we are approaching goal determination, administration, and governance with a similar stance of flexibility and responsiveness. In a paraphrase the words of Warren Bryan Martin some years ago, ...we function on the basis of "provisional certitudes".

Now what can I say of general nature to an audience such as this with regard to what we have learned and how we measure up?

Earlier I noted that I intended to plagiarize three sources shamelessly in the preparation of a set of criteria or rules of thumb against which to conduct such an assessment. They are: 1) The "10 system characteristics" of your own Charles Wedemeyer as presented to the 10th World Conference of International Council on Correspondence Education in 1975; 2) Stephen Bailey's 1974 remarks at the Western Conference on External Degree Programs; and 3) an article by Barry Schwenkmeyer in Planning for Higher Education which summarizes the experiences of Golden West College in non-traditional high education.

1. The first provisional certitude, which almost deserves status as an "eternal verity" is that it is desirable, it not essential, that the proposed innovative institution have complete autonomy from existing institutions.

2. As those responsible for the development of Golden West College in Orange County, California, suggest: "The more you know about various components in learning process, the more precise will be your application of techniques". To paraphrase that source further, if you would be an educational institution devoted to innovation at the higher education end of the education spectrum, it is critical that you keep your eye focused on the learning process. Moreover, a clear concentration or focus on learning should enable you to avoid or at least minimize the impact of the following "end-of-the-continuum" pitfalls:

a) The "academic" versus "technician" end of the continuum pitfall;
b) The "content" versus "process"end of the continuum pitfall;
c) The "professional" versus "management" end of the continuum pitfall.

All of these have in common a rejection of the interactive model and a preference for the we/they supremacy model. When cast in terms of the process versus content polar extremes, the familiar argument, goes as follows: It won't do any good at all to have the most sophisticated instructional design or development focusing on the most effective considerations of the process of learning if the content that is being presented is of insufficient or unacceptable quality. By focusing on the learning process I suggest we keep ever before us the reality of the inseparability of process and content.

To the extent that this argument is valid, it demands a rejection of a rule of thumb suggested by the Golden West College developers. Specifically, they suggest that you must place the faculty at the centre of instructional innovation, provide them with as much equipment, support and encouragement as you can but then give them their automony on the faith that they will see how technology can solve problems of interest to them.

While accepting the sentiment of that rule of thumb, and agreeing that given an existing more traditional institution that is trying to shift into an innovative stance, one may be forced to abide by it, it seems to me that in a context such as ours at Athabasca University it would be a mistake to capitulate to the faculty, academic, or content supremacy position.

3. But this kind of thing does lead me to concur with the third provisional certitude also advocated by Golden West: "put the emphasis on people". "Totally mechanized learning is not only dehumanizing, it is inflexible. The presence of a person in the instructional process eases adaptibility to new technologies and changing student needs."

Some of the experiences that Lorne Parker and his associates here at Wisconsin have had with the use of the telephone in education underscore the importance of this dimension. Certainly the experiences of the Open University in the United Kingdom, Tel Aviv's Everyman's University, and the more limited but intense experience at Athabasca underscore the importance of the human component in any educational effort. Athabasca University had to discover for itself that the attrition rate for distance delivery courses without a human component was horrendous and totally unacceptable. In the last year we have introduced a system of local course tutors working out of regional learning resource centres. These individuals function (as in the Open University model) as teaching assistants and as communication links to the central unit. While the absence of controls make it impossible to attribute causality to their presence attrition has been cut in half, and there has been accelerated movement through sub units of courses and generally improved morale since their use began. The spin off benefit is in our increasingly systematic needs assessment and course revision process. Having the right contact with our students enables us to get feedback much more completely and rapidly and to instigate required changes more expediently.

4. Related to that provisional certitude is the next Golden West rule of thumb, and one with which I enthusiastically agree, despite the theme of this organization and conference. In short it is suggested that you "Hang loose with equipment. Don't go overboard at first; one or two pieces of equipment may be enough to whet faculty appetites. Anyway by next year an improved model may be on the market. For delivery systems which must be purchased and installed at one time, consider the degree of user control they offer. Can the student or the teacher start, stop, and repeat the flow of information as he chooses? Consider flexibility of equipment, ease of operation, maintenance and the like."

Athabasca University has largely honoured this admonition but has the understandable, if not forgiveable, small new institution propensity for leaping on every technological band wagon that passes by, In a painful, tragic-comic, crying through your tears sense, our restricted fiscal support to date has kept us from doing much more than exercising the gleam in our eye toward many new technological advances requiring substantial expenditures of capital money. Had we been given the resources, I suspect we would now be conducting educational technology garage sales of substantial magnitude. So, from my judgement, Athabasca University passes muster on this rule, but more by default than by intent.

5. Eternal verity or provisional certitude number 5, sets the stage for an apparent contradiction between two of the authorities that I consulted in preparation of these remarks. In summarizing the Golden West experiment, Barry Schwenkmeyer states the following: "Start small and don't be afraid to make mistakes, but start". On the other hand, Stephen Bailey admonishes "My first hint about external degree programs (and by implication for any educational innovation) for post secondary education is don't. Don't that is," he proceeds immediately to qualify, "unless you have pondered the consequences and taken stock of the rugged terrain between where you are and where you want to go." Of course, I'm removing these authorities from their context unfairly, and distortingly in the interests of making my own point. Moreover, while both Bailey and Schwenkmeyer are obviously advocates of innovation and effective change, both are eager to insure that such advocacy is responsible and made with the best possible assessment of both courses of action and probably success. The combination of these two admonitions also provides a useful way to make another evaluative comment about Athabasca University's progress to date. Athabasca University was not afraid to start but did not take sufficiently to heart Schwenkmeyer's admonition to start small and not to be afraid of making mistakes. In point of fact, Athabasca can be fairly described as having exceeded reason in insisting that its initial development be devoted almost exclusively to the in-house, ground up, production of stand alone, distance delivery educational materials of such extraordinary quality that it required three years and a quarter of a million dollars per course to produce the first three courses. The motivation for this policy decision has been described as a form of ivory tower insulation that makes the traditional academy look open and outreach oriented. Now that may be excessive and a bit unfair, but there is no question in my mind but that we chose to tie ourselves to one production mode in ways that were nearly suicidal and we did so with virtually total disregard for the needs of the group that we claimed to be trying to serve. Our first three courses were called Ancient Roots of the Modern World, World Ecology, and The Study of Human Communities. All of these are extraordinarily good courses, packaged beautifully and, as noted earlier, costlier than hell. They are, in my judgement, contributions to scholorship in the real sense. Their contribution to providing an educational service is less certain.

6. But our failure to live by the rule of thumb that suggests that you start small and not be afraid to make mistakes enables us to loudly announce our virtue in not only espousing but acting in accord with the next provisional certitude which is - "Be prepared to shift gears". As noted earlier in our organizational chart, we have in effect reoriented our program and course development units, and more importantly the philosophy and objectives underlying them; we have expanded and taken the restraints off of our delivery approaches. In short we are setting ourselves up so that we can demonstrate to the world that we weren't afraid to make mistakes. We have even begun to "co-operate with others". We see ourselves as complimentary to the university system in the province and in some sense Canada, and we have now established working relationships with community colleges in other provinces, transfer arrangements with universities outside our province and incipient program articulation arrangements with all of the universities within Alberta. While it may be the case that the co-operative relationship that we feel, particularly with regard to our sister institutions within the province, is a function of our being seen somewhat like the delightful and precocious child that is born to a couple late in life, and that it will change when the nature of our call on the family resources becomes a significant proportion of the total available to all, we are without doubt being assisted in major ways by the Universities of Lethbridge, Calgary and Alberta and indeed could not have developed to our present state

without their support both moral and physical.

In summary our self concept at Athabasca University, to indulge in a somewhat tasteless play on words, is idealistic pragmatism. We do believe that we're involved in something of major importance and we demand the right to dream and to be bold in the pursuit of those dreams. We believe we know our place in the scheme of things, but argue that place is one of considerable magnitude and importance. I personally have never been as involved in a development as I am in this one and despite the personal misgivings of adequacy that I have dragged before you in violation of every rule of good taste, I have no doubt that we are now, and will increasingly in the future make a major contribution to the provision of educational service at the university level in the province of Alberta and beyond.

I find it difficult to conclude remarks in a context such as this without literally telling you everything I know and have read about educational innovation. Of course you are aware that I have already exceeded that parameter. But I will now finally put these remarks to rest with two concluding acts of plagiarism. It seems to me that if you are contemplating any innovation whether it involves the use of a particular technology or a process innovation, the route to salvation described by Peter Aycough in an article entitled "Academic Reactions to Educational Innovation", should be kept in mind. In essence, Dr. Aycough is talking at the level of the individual and describing a program of personal salvation. I submit that these six steps (which I have condensed to 5) can be equally appropriately generalized to the department or institutional level. First there must be established a predisposition to consider innovation. No matter now brilliant the proposal, or impressive the potential improvement, the absence of a sufficient openness to it is critical. Second, the proposed innovation and its potential must be clearly and crisply understood. Third, there must be a recognition that the innovation is relevant to one's own or the institution's need. Fourth, there must be a willingness to learn how to use it. Fifth, and perhaps most critical, there must be an ability to identify a potential personal contribution. Since I am arguing that this scheme for personal salvation can be generalized to the institutional level, one would need to add, as Aycough recognizes, such other factors as cost, the effects on existing curricula, the effects on other members of staff, and the relevance to objectives and attitudes at the departmental level.

But back to Bailey to finish. In a cute allegory which he describes as a "latter day pilgrim's progress" Bailey leads us to the terrain of innovation. Forgive me for the length of this quote but it is an irresistibly appropriate way to wrap things up.

"As you leave the Delectable Garden of the Traditional Establishment you turn left and are faced immediately with a yawning canyon called Status Lost Gulch. The paths are so steep and so pebbly that it is almost impossible not to lose your footing and to plunge and roll down the side of the cliff. Everytime you do, when you pick yourself up, you can hear laughing hyenas guffawing hysterically at your follishness. You shout back, "but I am a pioneer, a pioneer, a pioneer". A distant echo returns, "On year ear, on your ear, on your ear". At the bottom of the canyon, you stumble pained and bruised toward a cave called "Caution" where you can rest -- away from the merciless sun of exposure. But you dare not rest long, because you do not really know how far you have to go. You take a swig from your canteen -- a heady elixir of faith and bravado -- and start across a barren wasteland known as "Denigration Desert". In the distance there are mountains. The air is clear and you are suddenly elated. You can almost touch the range known as "Future Felicity". Little do you realize that the mountains are actually hundreds of miles away, and that there are fearsome hazards ahead.

One of the first hazards is the sight of bleached bones. You begin to stumble across old carcasses and the skeletons of those who have gone before you and never made it. Great carrion -- known as Old Academic Buzzards -- are wheeling around ready to pick you clean if you falter. Only self-confidence and the belief that you are doing the Lord's work keeps you going. To refresh your spirits you draw an outline in the desert of the new academic world you plan to build in the mountains of "Future Felicity". But no sooner has your sketch been competed than one of the Academic Buzzards screams, "old hat" -- and scrathes his talons against your exposed belly as he wheels past. Other carrion shout in derision such slogans as "Dewey not Newey"...

Shaken you stumble on. Tired and thirsty you are about to give up when you come to an oasis. Cool, fresh water is bubbling up from a spring marked "Newman-Carnegie". You drink deep and then to your delight you see a basket of shiny apples under a palm tree. You gorge yourself, until as you near the bottom of the basket you see something move. To your horror you realize that there are serpents at the bottom of the basket of shiny apples. The serpents names are Meritriciousness, Garden Path, Costliness, and Untransferability of Credit. The last is a King Cobra. You start to run, but you have a nighmare panic that the serpents will follow you into the mountains of "Future Felicity".

Alas my allegory has no end, for most innovators are still in the foothills of the mountains of "Future Felicity". Some are reassured by the fact that they can see a few hundred yards ahead through a substantial thicket to a few bold explorers -- a few intrepid souls but none of theme is actually totally out of the woods, and they are as aware, as any of the serpents that emerged from the basket of shiny apples that still lurk in the underbrush".

Bailey completes his remarks arguing that there are five rules that will help you to avoid letting "institutional rigidities, vested interest, threatened psyches kill green shoots of hope" whether they be cast as a new kind of language laboratory, an audio-tutorial system, an interdisciplinary major, an imaginative practicum, an external degree, a semester, a broad opportunity, a regional learning service, a new curricular paradigm" -- or whatever, These five are in point form as follows:

1. "Prepare for a long struggle. Gather psychic and material resources that can sustain you after the first burst of enthusiasm has left others overwhelmed.

2. Plan your campaign. Look hard and realistically at the hurdles to be overcome, the fears that must be tempered, the antagonisms that are predictable, the allies that you may be able to pick up along the way, the methods and instruments of communication at your disposal.

3. Form a team. Once your campaign is planned, do not try to go it alone. For one thing you will get tired and will need reserves. For another, early team formation gives allies a sense of participation in the developing, exciting, stages of the innovation.

4. Be willing to compromise -- with friends as well as with antigonists. Your innovation may have emerged full-blown and pristine from the recesses of your own brilliance, but it will not remain that way. Others will see flaws that you never dreamed of. A few toll gate keepers will want a chunk of your dream, as the price for letting you through. Unless you have zest for bargaining, unless your strings of resiliency can resonate to someone else's enthusiasm you will never innovate successfully in the halls of academe.

5. Finally, master the tactics of procedure. Most academic innovation involves endless clearances: departmental, divisional, administrative, legislative, financial. There are both rhetorical and budgetary arts that are peculiar to each level or segment of decision-making. You and I have seen a number of good ideas come a cropper because enthusiasts were not willing to take time and pains to understand the nitty-gritty of progress."

Bailey notes that most innovative, non-traditional institutions go through three psychological states in the course of their early development. First, there is the state of euphoria, second, that of despair, and the third, a stage of considered and sober optimism. After 5 years plus of existence, I believe Athabasca University has come through those three stages and is indeed at the stage of realistic idealism or pragmatic idealism. In short we know many of the problems that we face, but we retain our excitement and enthusiasm.